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West Coast Business

By Mark R. Lamb*

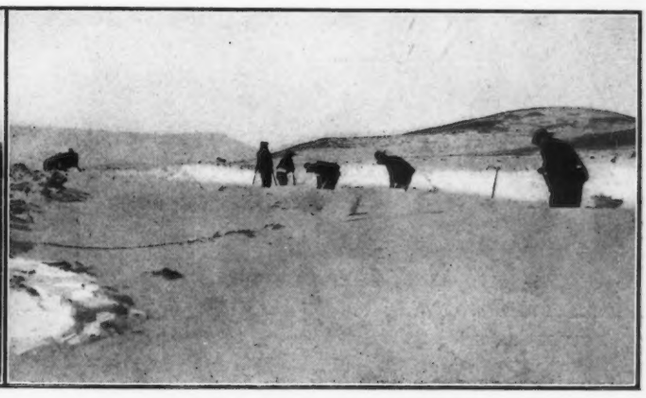
SYNOPSIS—The manufacturer who is looking for easy money will not find it on the West Coast of South America. The buying power per thousand of population is much below that in the States, even in normal times, and now it is crippled by the war. Interest rates are high, but industrial earning power of capital is often low.

Much has been written lately of the business opportunities in South America for the American manufacturer. At first the statements were wild and conditions much exaggerated, but lately the newspaper and magazine articles which we see here in Chile are much more reasonable and truthful pictures of conditions. If the first rosy pictures were allowed to stand, many manufacturers would send for some of the easy business and would be much disappointed. To be sure this would clear the field of American competition for those of us who are here to stay, but there is another point of view. If only those who are warranted in having their own representative in the field will make a start on the West Coast, it will be better for all of us. And if by any chance American capital should begin to enter this field, then there would really be business. There are many opportunities not only in mining but in other lines, and as the banks pay 7% on six-month deposits and the return on the gilt-edged bonds of the country is around 9% at the market price of the bonds, it is easy to see that there is opportunity for investment.

In choosing a representative for the West Coast or for anywhere else in the world, the main thing is that he should know his goods. Speaking Spanish, or French, or Portuguese is merely a detail, and given a year of contact with a new language, the average man will pick it up rapidly. While he is learning it is advisable and not too expensive to use a translator. The world is full of waiters who speak several languages. Nevertheless, the salesman should have all his Spanish letters written by some one skilled in Spanish composition, however long he has been in Spanish-speaking countries. Nothing makes quite so bad an impression as a badly written letter. Badly spoken Spanish is overlooked because of the ideas expressed—and also because most foreigners speak that way. There is no other way to speak Spanish except to speak it as best you can. But it is easy to send out well written letters, especially by using a dictaphone. With this machine, it is possible to dictate in the worst kind of Spanish, and the typist, without knowing any English, can put your thoughts into intelligible language. So much stress is laid upon the importance of knowing Spanish that the above explanation seems necessary. The big houses are continually bringing out new men from England and the States who are useful even as clerks while they are learning the language. The specialist who is brought out to sell electrical machinery, machine tools, air drills or locomotives quickly learns to express himself, whereas if he knew Spanish and nothing of locomotives he would have a very bad time of it and his contract would not be extended.

Although railway fares seem low, traveling is rather more expensive here or on the East Coast than in the States. If one makes the trip through Peru, Bolivia and Chile for the first time, his expenses will figure close to $12 per day. This includes an occasional horse, guide and pack mule to reach some distant mining camp, or it may include a special coach to avoid waiting for the

Breakfast Stop at Pazña, Antofagasta Ry.



Snowbound at Ollague, Bolivia, June 1-3

*Manager, Allis-Chalmers Mfg. Co., Santiago, Chile.

weekly train. The ship usually supplies you with dirty water and ice, and bottled water is cheaper than a delay with typhoid. The stewards expect their tips just as much as if your representative was traveling with his own money and until he is thoroughly familiar with the various robber bands that take him ashore at the various ports, he is likely to pay excessively for going ashore and aboard.

For no service whatever, comparatively speaking, the hotels along the coast charge more than in New York, and in Bolivia a hot bath is not to be had unless some friend takes pity and lends you his. This is no joke.

The manufacturer who cannot afford a representative of his own, must choose a representative among the dealers here and my advice is brief and clear. Find a representative who knows *your* line, who is in business *already* and who does not represent several of your competitors.

It may seem curious that it is necessary to advise that the representative be in the same line of business. But the main point made in asking for representations is the fact that the applicant is a successful banker, or steamship owner, or he is a nephew of the president, or he speaks Spanish—none of which qualifications have anything to do with his value as a representative. Would the National City Bank be a good representative for retailing 21-lb. shovels in New York? Is it likely that the White Star Line would make a success of selling vacuum filters in Colorado? Or would Kermit's being son of our next President make it easier for him to sell a municipal pumping engine on a duty basis?

As regards being in business already, we are being flooded with enthusiastic and well meaning hopefuls who *are* going to *start* a business all right—but who only *think* they are going to make a success of it.

Joint Representation Inadvisable

As to representing competitors, that is all right in the automobile business in the States, where there are so many different types of autos and such a varied line of prices, but *no* representative is better than one who also is exclusive agent for your competitor—because he does not work for you, sells what is demanded, and takes commissions from both.

I have seen one such agent with catalogs, price books, samples, superseding price sheets and circular letters all piled on a shelf together, who represented six manufacturers of cutlery, tools, etc. No one in the place could quote a price or knew the difference between a stope wrench and a left-handed saw. The branch-office manager of another such agent asked the newly arrived man from the factory what kind of machinery they made! Another agent on the nitrate fields, representing a large manufacturer of crushers said frankly that he would buy nothing but English crushers for a plant his owners were building! There is nothing here to take the place of Dun and Bradstreet, so information on prospective agents must be got from whatever friends you have along the coast.

There are but few American manufacturers that have a large enough line of products which are in demand here to afford to have their own branch either in Chile, Peru or Bolivia. It does not follow that because it is profitable to have a branch in San Francisco it will pay to have one in Peru, Bolivia, Chile, the Argentine or Brazil. For example, Chile has a population of about three millions but their purchasing power is not equivalent to an equal number in the States. This difference is due to a variety of causes such as lower wages, fewer necessities and simpler habits. Another important reason is that there is lacking the extraordinary system of advertising and service that we have in the States that practically prepares a market for any good thing before it appears—and maintains the market afterward. In Chile, the only way to sell is to make a canvass from plant to plant, ready to prove such elementary propositions as that patent flour is better than roasted wheat ground between burr stones, or that classification is a good thing to provide preceding concentration, or that the cyanide process is really a success. The sanitary-fixture salesman finds just as curious conditions as any other. For example, in renting an apartment, you will find that your predecessor took his electric lights and wiring, his bath tub, sink, gas piping and water closet with him to the next house and you are expected to install whatever you require of these luxuries. This is not exceptional and even houses built by foreigners are rented this way. The point is that the plumber, while perhaps making more installations than he would under the American system, finds it difficult to convince his patrons that really fine installations are good investments.

Most of the road transportation in Chile and Peru is done by oxen with high, two-wheeled carts. Three and four mules abreast are also used with a lighter two-wheeled cart, and I have yet to see a real four-wheeled horse-drawn farmer's wagon. Whether such a wagon is better than the two-wheeled carts is a question here, naturally, and it is a point which must be proven before the salesman can begin to sell wagons. This is a handicap of which he does not dream when he leaves the States.

Hand-Screening of Hand-Crushed Tin Ore at Huanuni

There are several flour mills in Chile and a few in Peru. The largest in Peru is at Callao with a daily capacity of 480 bbl. in 24 hr., 200-lb. barrels. These mills make good grades of flour—as good as flour made elsewhere—and in Peru an import duty of $1 per 100 lb. helps the miller. But many, many country people grind their own flour in simple burr mills. This condition is a hurdle which must be faced both by the flour salesman and the milling-machinery salesman.

Public Utilities on the West Coast

The industry of selling electric lighting and power on the West Coast is pretty well absorbed by the present interests. There is ample power available from Panama

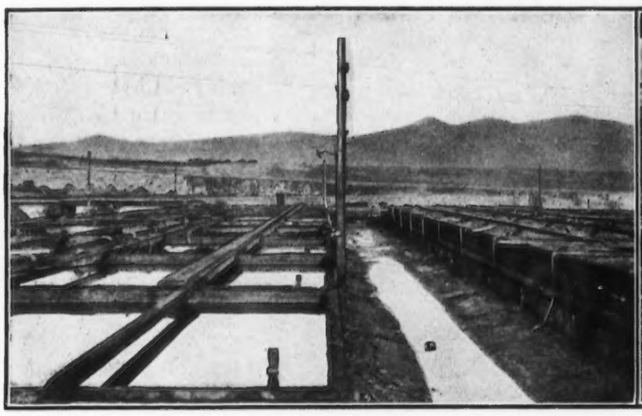
to Magellan on the west of the Andes, but the difficulty is to find a use for it. The Chilean Electric Tramway & Light Co., Ltd., provides light, power and street-car service at figures that positively would not be attractive to American capital. For example, the usual fare for a ride to any part of Santiago (except to the most distant suburbs) is equivalent to three cents for first-class and half of that for second class. As the second class is merely the top deck of a double-decked car, the cost to the company of carrying a second-class passenger is the same as for a first-class passenger. The company has many difficulties to contend with that are not encountered in the States and Europe which it is not necessary to enumerate, so that it is giving more service for the return than does the American traction company. The streets are narrow and big cars are entirely out of the question. All the above applies to the system in Valparaiso and Concepción, though as these are much smaller than the Santiago system they are not so important as investments.

There is a good modern system of street cars at Lima, very small ones at Arequipa and La Paz. When nitrate is again a marketable commodity perhaps Iquique and Antofagasta may afford very small lines of street cars, but outside of these the electric-railway engineer can see nothing here. There are a few small towns like Chillan which could support two or three cars and which are near cheap power, and there is a really good opportunity for an interurban line between Coquimbo and La Serena, but neither is hardly large enough to be of interest to American capital. The money to provide the power and equipment will come from Germany, France or England—and so will the equipment.

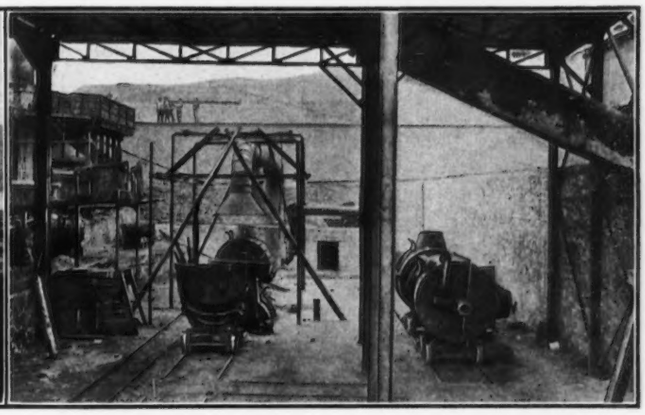
For a long time to come there will be no important new railway work in Chile, Peru or Bolivia. A line may be extended to Cochabamba in Bolivia, and a short cut-off may be built between Santiago and Valparaiso, though these projects are both a long distance in the future. The Longitudinal Ry. in Chile is completed as far as Iquique and is very useful to the interior districts. However, as Chile is so narrow, it is all near the coast, and the steamers will always do the majority of the carrying and passenger business. The Longitudinal is almost completely equipped and the equipment is largely French and English. Occasionally American locomotives and cars are sold here and when Americans contract for the construction of the railways this also leads to sales of locomotives and cars, but the cases are few. It is rumored here now that the Chilean government will buy a few locomotives from the Canal Commission, but new material is not likely to be purchased, even if times get good quickly, and this latter will not happen until a market is found for nitrate and copper. Peru needs a market for her cotton and rubber, and Bolivia for tin and rubber, the railway program for the latter country having been entirely upset by the drop in price of tin.

Lumbering a Minor Industry

Lumbering in Chile is only a minor industry due to the scattered condition of the timber, the lack of transportation facilities and also to the cheapness with which Oregon and California lumber can be brought in and sold. Lately the railway rates, both freight and passenger, have been raised about 50% and the lumbermen complain that this is killing their business. What lumber is cut is made with the simplest of circular saws and I think it is safe to say that there is not a band mill in Peru, Bolivia, Chile or the Argentine and there may not be a place for one. The waste in cutting lumber in Chile is great as the trees are small and the circular saws make a lot of sawdust. Besides this, the lumber is shipped as fast as cut and therefore reaches the market wet and at a disadvantage as compared with American lumber. The lumber business is only large from a South American point of view, since one county in Oregon will produce more lumber than is cut in all of South America together.



Copper-Leaching at Guayacan, Chile



Hand-Operated Converters at Chañeral, Chile

Perhaps this is a good place to again call attention to the relative size of the South American market. Based on population and purchasing power, Peru, Bolivia and Chile taken together will not equal San Francisco as a field for selling modern machinery, even after discounting for the competition in the home market, which is somewhat keener, perhaps, than here.

Although concrete construction is becoming increasingly popular, there is but one cement plant, and that a small one, on the West Coast. Though it makes a good quality of cement at a much lower price than cement can be imported it is not a successful venture from an American point of view. The selling of cement should be a good small business if the manufacturer would send his own salesman and carry a stock, but as it is usually sold—one dealer being agent for as many brands as possible in order to keep out competition—the manufacturer does not get the profit to which he is entitled.

Lately a desirable concession for the exclusive right

to make cement in Peru for a long term of years was granted and that is a bright and shining example of an opportunity which has been open to American capital and yet will probably be taken in hand by someone else. The selling price of the cement is fixed in the concession, but it is so high that the profit will be more than the average selling price of cement in the States. A similar concession could be obtained in Bolivia and would be a benefit to the country and a source of profit to the owners.

With the exception of the plants at the port works at Talcahuano, Valparaiso and Cruz Grande there is not a proper stone-crushing plant on the coast. Santiago is using about 600 cu.m. of sand, gravel and stone daily. Most of it is dug out of the river by hand. The crushing is done in the simplest possible plants, consisting of a motor and a crusher, the material being fed to the crusher and taken away by hand. There is one No. 4 gyratory with elevator, trommel and bins, but I believe it is the only one in Chile, Bolivia and Peru. Ballast for the railway is crushed in the same simple way, the power usually being a portable boiler and engine on wheels, and the crusher being a 10x20 in. at the most.

Power Goes Begging in Chile

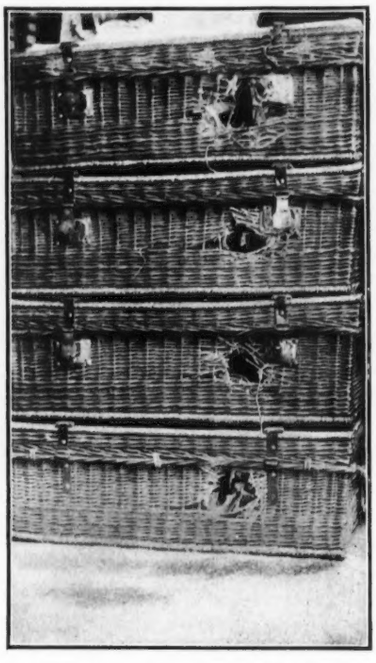
Power opportunities, as stated above, are frequent along the coast except through the nitrate districts, but no one can find a use for the power. A short time ago a power proposition near Santiago was offered to an American company which sent its engineer to examine the field. The power proposition was feasible, but the engineer could find no sale for his power. The present company has an excess of power over that required for the street cars and lights and furnishes power at a reasonable figure. There are few industries requiring power which are established here, probably because there is no protective duty, the funds for the government coming largely from the nitrate industry. A glance over the city shows only here and there a cracker factory, a laundry or a shoe factory. All around the city are irrigation canals which provide power at low prices. There is one turbine in the center of the city which will supply 70 hp. and which goes begging for a user. The city will give the power and turbine and a reasonable site to whoever will supply a reasonable amount of lighting current during the evening. The trouble is to find a use for the power. If the power available in Chile is ever used, it will be in some important industry in no way connected with the ordinary life of the people.

Throughout the nitrate districts, steam has been the main source of power and will continue to be for a long time, though here and there the Diesel engine is being installed. Lately the California fuel oils have been replacing European and Australian coals, and for the Diesel engines a light Peruvian crude oil is used which sells in tank cars for around 75s. per long ton—about double the price of the California residues.

Each nitrate plant has a big boiler equipment, Boquete, for example, having eight 8x30-ft. Lancashire boilers, and Boquete only makes 35 tons of nitrate daily. The power requirements in a nitrate plant are relatively small and as the steam pressure required for the process is around 40 lb., it is easily possible to use the steam for the power at a higher pressure, using the exhaust at the desired 40-lb. back pressure, thus obtaining power even cheaper than by the use of the Diesel engine. There are disadvantages, however, to this system, which have left an opening for the Diesel.

The whole prosperity of Chile and therefore its purchasing power is bound up in the nitrate industry, and as a barometer of conditions in this country nothing could be better than the market quotations of price and shipments of nitrate. The barometer for Bolivia is tin. Also, nothing would help get business in Chile and Bolivia like finding markets for these products. The cables have advised us at times that we could expect to see American ships sail along the coast with merchandise for here with a good capacity for tin and nitrate for the States, but we are still waiting for the ships. Meanwhile the first of a fleet of Norwegian oil ships reached Valparaiso today and advises that there will be a 15-day service through the Straits and back through Panama, the ships having first-class passenger accommodations and planning to take nitrate home.

Lately the Chilean government has chartered two navy transports to the Antofagasta Nitrate Co. and to Gibbs & Co., so that nitrate can be shipped in neutral ships, and as the manager of the Antofagasta company will reach the States this week with the idea of selling a cargo of nitrate there, it is to be hoped that he will be given every assistance by those who wish to sell machinery in Chile. So that the importance of this business will be realized it may be stated that the production of the plants under Mr. Alibaud amounts to the very respectable figure of $12,000,000 American currency on a price basis of $40 per ton. There are 170 nitrate plants, of which the Antofagasta company owns six or eight.



The Advantage of Wicker Cases

Mining on the West Coast

Mining along the West Coast should be divided for commercial purposes into groups, as follows: One consists of the big American concerns like Braden, Cerro de Pasco and Chuquicamata, who do all their buying in the States through New York buyers. Then there are the European companies which buy almost exclusively in Europe. The third group comprises the local and small concerns which buy locally, or of whoever can make the best showing. It is to these latter that the salesman of machinery or other merchandise must look for his orders. This group can be further divided for convenience into a group comprising the comparatively large tin-mining companies

which operate in Bolivia but which are owned in Chile, and another group which includes small copper, lead, silver and gold mines.

The tin companies can be counted on the fingers of one hand and the others—even counting the smallest operating mines—can be counted on both hands so far as the interests of the salesman are concerned. There are of course many small prospects and many small mines that are worked by contractors who sort and ship substantial quantities of ore, but as they buy no machinery they are of no interest to the American manufacturer.

Even the tin miners are not ordinarily important buyers, as their equipments are now more or less complete and no new mines have been discovered for several years. Within the last two years the Bolivian operators have become interested in air drilling and this has led to a number of satisfactory sales of compressors and drills by the manufacturers of this type of machinery, in spite of the high altitude and consequent loss of volumetric efficiency of the outfits.

Lately the price of tin has been low and when this obtains the purchases are cut off entirely. The price quoted by cable from London today was £140 per ton so that the tin miner is again hopeful. At this price, the Bolivian mine can make a profit so there are again hopes of selling mining and concentration machinery occasionally. At the present moment the mines that are operating at all are working with a minimum force under a low wage, since due to the closing down of some of the mines, the labor market is over-crowded and many of the laborers are working for their food only. Many of the thousands of nitrate laborers who have been let out are returning to Bolivia, with the result that there are 10 men for each job and there is much privation. There are districts in Peru and Chile also where laborers are working for their board. I passed an irrigation-ditch digging gang near San Rafael where 50 men were working for these terms, and men are offering to work near Coquimbo for the same terms. This is no discredit to the country or the men. On the contrary, I think it is a striking proof of the reasonableness of the Chilean *roto*.

My personal expectation had been that the European mix-up would result in orders for me for spares which would be urgently required and which could not be got out from Europe. This would have been the case had conditions remained normal, but with no prices for silver, copper, nitrate, rubber, cotton or any other of the West Coast products, no one has money even to buy urgently needed spare parts and most of them have no need for the parts. In a few cases such parts as were required were for special European machines and could be made only with the shop drawings at hand.

No Credit Trade at Present

The big houses in local trade, which always have out a long line of credits, are much worried. There is no such thing as credit now, and it is so bad that positively the largest houses will not trust each other, not knowing how heavily the other may be involved with German credits which may or may not be good after the war is over. Where the houses are German, the explanation is reversed, as bills payable in England are in some cases dishonored. This means that every bit of business is strictly for cash. One paint salesman who has made this territory several times before, has heretofore made his sales through importers with New York connections. He is here now and has received nearly $20,000 in orders under the usual terms, but can find no local house that will assume the credits. As paint is a material that is kept in stock for months it is not possible to sell much of an order for cash, so that this salesman has decided that he can do no business here—though he can get orders.

There is rarely any question of the quality of American goods. Montero, the big hardware man, will show you three wrenches, let us say, and will explain that one is German, the next English and the third American. He will explain that the American costs more and is best, the German is cheapest, and the English is in between. Mrs. Lamb bought an alarm clock at a jeweler's and was shown several kinds. The jeweler explained that he would guarantee any of them, but that it was not necessary to guarantee the American—it guaranteed itself.

The question of packing has so often been lectured upon that nothing further should be required—but it is. The four basket trunks shown in the illustration (p. 436) were shipped packed with shoes and only crated instead of boxed. An oar handle served the launchman to open them, after which the contents were removed. The baskets were then sent on to Bolivia in this condition. The moral is to box heavily.

While ordinary business is the same here as elsewhere, there are some things that are decidedly novel. To begin with, the telephone is so far behind American service that it is difficult to express a comparison. The series of operations required for getting a connection requires special prayer and preparation and a great exercise of patience. For this reason people who really should have a telephone often do not. It is not fair to blame the company with the bad service, since the user is quite as much to blame. It is a frequent thing to hear the phone ring and no one attend it. Often the ring is due to a crossed line or an error in the exchange, so about half the time it would be right to ignore the ring, but it is a bad practice to get into. Again, it is considered quite the thing to discuss the matter with the operator in case the connection is slow, or wrong, or indistinct or a failure in any other way. If it were a crime to sass the operator, half of Santiago would be in jail. I look back with considerable amusement to my first trials of the system several weeks ago, when I would actually lose my temper. Now I only seem to.

Afternoon Tea Adopted by Chile

The Chilean has taken kindly to the English custom of afternoon tea and it is universal custom to take 15 minutes to half an hour off about 4:30 and enjoy a cup of tea and a cracker. The favored enjoy their tea in the quiet corners of the Club Union—the club which to my mind is the most intensely interesting and live of all clubs. This impression is not due to the building, which is old, nor to the equipment, which is only good, but to the fact that it is the popular, personal club of the brightest and chosen men of Chile. In a country the size of this all of the upper crust of the upper class are personally acquainted with each other and a large percentage are related by marriage. It is this feature of universal acquaintance and cordiality which strikes the stranger and which makes it the club ideal we have all hoped our own clubs would be.

Sulphuric-Acid Manufacture in Great Britain

According to the 50th annual report of the British Alkali Inspector (abstr. in *Journ. Soc. Chem. Ind.*), further advance was made during 1913 in the prevention of the escape of metallic fume and in the reduction of acid escaping with chimney gases, but the acidity of gases from lead- and copper-smelting works presents a problem which still awaits solution, and the amount of sulphur escaping into the air from the blende calciners in the immediate neighborhood of Swansea (within an area of 4 sq. miles) is equivalent to approximately 80 tons sulphuric acid of 150° Tw. (sp.gr. 1.75) per 24 hours. At one large spelter works chambers are being erected for the manufacture of sulphuric acid from the gases, and it is suggested that by calcination in muffle-type furnaces, at a central works, or by arrangement with vitriol makers, the whole of these waste gases might become a source of profit instead of polluting the air.

More attention is now given to providing wider space between sulphuric-acid chambers, thus affording greater cooling space and condensing power, longer life to the chambers, greater ease in effecting repairs, and opportunity for keeping the outside of the chambers clean; the practice of limewashing chambers and woodwork is commended as tending to preserve the latter and as making evident the slightest leak. Incasing flues from burners to denitrating columns in cast iron has been found successful in preventing local escapes due to weakening of the brickwork by heat.

Appreciative reference is made to an apparatus called "Nitrophor," devised to control automatically the supply of niter to the system by responding to alterations of temperature of the chamber gases, but it is pointed out that influence may be exerted by factors other than the chemical actions taking place in the chambers.

Glass-packed absorbing towers are being used in increasing numbers, and water sprays in lieu of steam for supplying moisture to the chambers are on the increase, although in Scotland there is said to be some tendency to return to the older system. The injection of sodium-nitrate solution into the first chamber instead of "potting" nitrate in the burner flue is also becoming popular. In Scotland, fans for controlling draft and additional Gay-Lussac towers are in more general use, and a strong solution of soda ash has been employed at several works to reduce obstruction of towers by chemical deposits, with good effect. The undue escapes previously reported during the concentration of acid in over-heat pans were greatly lessened. Kessler plant came into more extended use during the year; the substitution of mechanical means for obtaining the necessary draft further replaced the high-pressure steam-jet aspirator originally used in all installations of this form, with advantage as regards steam consumption, and strength of recovered weak acids. The cascade system was also further adopted, silica ware, "tantiron," and, to a small extent, "ironac" being in use for making the evaporating vessels.

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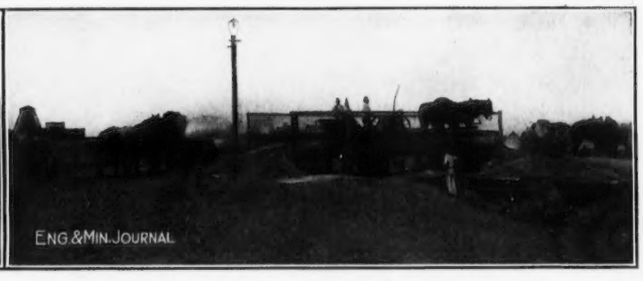
Cementation at the Wallaroo & Moonta Mines*

The Wallaroo and Moonta mines are situated in the northern part of Yorke's Peninsula, in South Australia. The deposits were discovered by accident in 1860, and were separately operated until 1889, when they were combined under the name of the Wallaroo & Moonta Mining & Smelting Co., Ltd. The total production of ore has been about 10,200,000 tons averaging 3% copper, and the output of fine copper about 283,682 tons. Treatment is by direct smelting, or concentration, cementation and smelting.

Jig tailings are treated for the recovery of the copper which they contain. The large accumulations of old tailings are in five heaps, varying in height from 30 to 60 ft., and covering an area of about 60 acres. The top is divided by little ridges into 12-ft. squares, so that the distribution of water may be promptly controlled. Only a part of the heap is subjected to leaching at any one time.

PLOWING SLIMES TO PROMOTE OXIDATION



LOADING CARS WITH WHEEL SCRAPERS

Exposure to the atmosphere oxidizes the sulphides in these tailings and by slow degrees they become decomposed. Saturation by water containing iron salts may greatly expedite this decomposition and encourages the gradual conversion of the sulphides into soluble salts. In addition to other salts, the water circulated contains about 100 grains of sulphate of iron per gallon, and a fractional percentage of free sulphuric acid. It is pumped onto the top of the heap by Worthington compound, duplex, acid-resisting pumps (made of special alloy), which force 20,000 to 40,000 gal. per hr., as required, through 2¼ miles of cast-iron wood-lined pipes. A pumping station at Moonta Bay provides sea water to supplement the mine water and make up for losses through evaporation and a certain amount of seepage.

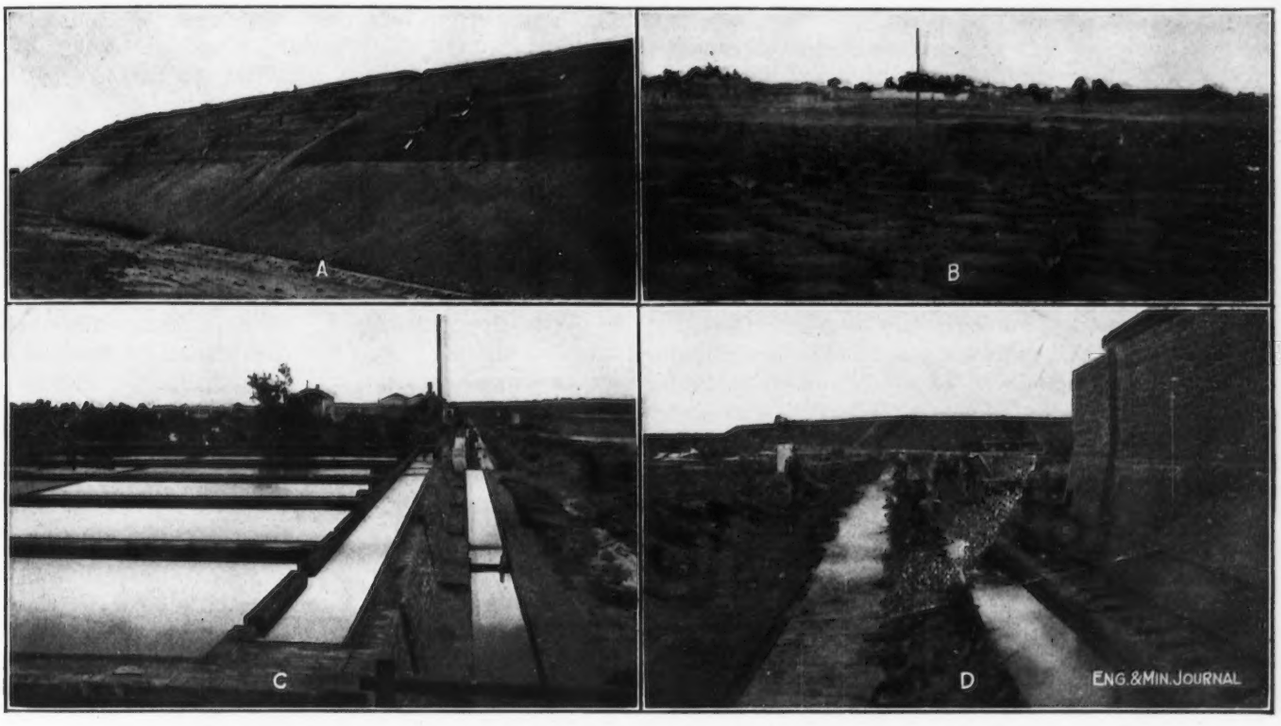
The liquors are pumped onto the surface of the heaps, and, in percolating, collect the soluble copper sulphate in their passage. The solutions then drain through earthenware pipes to six wood-lined masonry tanks, 60x30x3½ ft. The first two are for clarifying the liquors and the remaining four are charged with scrap iron, the liquors

*Abstracted from "Min. and Eng. Rev.," Melbourne, Australia, June 5, 1914.

depositing by precipitation a portion of the copper they carry. From these tanks the copper solutions gravitate through about 3000 ft. of wood-lined canals, 2 ft. 8 in. wide by 9 ft. deep, also containing scrap iron. By the time the liquors reach the end of these passages practically all of the copper has been precipitated. The water charged with the sulphate of iron resulting from these reactions is returned to the circulating pump, and again lifted to the heap to recommence its work. The tailings heaps contain about 1,500,000 tons, estimated originally at 0.9% copper, in addition to which slimes deposits amount to some 323,000 tons.

The old slimes from the concentrating process, not being amenable to treatment by percolation, are exposed in shallow heaps for oxidation, the process being greatly accelerated by a well arranged system of plowing, so that different portions of the slime are exposed to air at different times. The slimes are run out into flat places in the ground, where they are dried. After drying, they receive the plowing treatment, and are then loaded into cars and taken to the treatment plant. At this plant, the material is passed through agitators with the liquors containing iron and other salts, to which sulphuric acid is added to the extent of from 10 to 20 lb. per ton of slimes, according to the character of the material. The quantity of water used is sufficiently large, 1200 to 1400 gal. per ton of slime, to convert the product into a thin pulp. This is conveyed by long launders to settling dams, where the slimes are deposited, while the liquors pass through clarifying reservoirs and thence through earthenware pipes to join the solutions coming from a tailings heap in the precipitating tanks and canals.

The precipitate from these operations is removed from the tanks and canals at frequent intervals. It is washed, cleaned, freed from metallic iron, dried and sent to the smelting works. The total amount of precipitate recovered up to the end of 1912 was about 9400 tons, having an average of about 76% copper. An annual quantity of about 700 tons of copper is being obtained from this source.



CEMENTATION PROCESS AT WALLAROO & MOONTA MINES, SOUTH AUSTRALIA

A—Tailings heap under leaching treatment. B—Drying out the slimes. C—Precipitation tanks and canals and pumping station. D—Cleaning precipitate from the canals.

Observations on the Appraisal of the Iron Mines of Michigan*

As the present system of appraisal of the mining properties of Michigan for the purpose of taxation has been in force for several years and promises to be permanent, it will be of value to review what has been done, for the benefit of those who have been too busy with other matters to follow it.

Prior to 1911, all property in the state, except that of railroad, union-station and depot, express, telegraph and telephone, sleeping-car and car-loaning companies, which was assessed by a state board of assessors, was assessed by local officers, and their assessments were passed upon by local boards of review. That this resulted in gross inequalities, both local and state-wide, was inevitable. It was also inevitable that such assessments should be at a low ratio to cash value. The assessors had neither the time nor the ability to assess the property of their districts properly and inequalities in ratio were much less evident than inequalities in actual cash value. Moreover, as the counties were equalized by the State Board of Equalization, as to the proportion of the state tax each should bear, and as the townships and cities in each county were equalized by the county board as to

*Abstract of an article by C. H. Baxter, superintendent, Loretto Iron Co., Loretto, Mich., in the Michigan College of Mines "Alumnus," July, 1914.

the amount of state and county taxes each should pay, the whole tendency throughout the state was toward an artificial value at a low ratio to the actual cash value.

Taxes throughout the state were rapidly increasing as greater demands were being made upon the state, counties and municipalities. Under these conditions some of the powers of the state began looking around for some one to pay the state tax, which was about 15% of the total. The taxes received from the railroad, telegraph and telephone and other similar companies were returned to the municipalities as the primary-school fund and were proportioned according to the school census. This fund was jealously guarded, most of the settled farm districts receiving more primary-school money than they paid out in state taxes. In more sparsely settled districts, of course, the reverse was true. The wealthy mines of Upper Michigan, "whose non-resident owners were robbing the state of its resources and who, through the control of local assessing officers, were paying but a pittance into the state coffers," seemed the most likely source. The state grange advocated a tonnage tax in lieu only of state taxes, and in the 1911 session of the state legislature came near getting a bill passed that would have crippled the mining industry of the state. It was argued that it was impossible to value a mine, and that the only way to make the mines pay their share of the taxes was the tonnage-tax method, which in this bill consisted of a flat-rate royalty of 15c. per ton.

In this session of 1911, the power to review and correct the assessments of local assessors was restored to the State Board of Tax Commissioners—this board had been created in 1899, but its power had been later materially restricted—and under the pressure of public opinion, the board began on the mines. It engaged James R. Finlay to appraise the mines of Michigan, and he in turn engaged Dr. C. K. Leith as assistant on the iron mines, William Hague for the copper mines, and Dr. H. M. Chance for the coal mines. Mr. Finlay's method of valuing the mines has been generally accepted as correct in principle. He computed the value of a mine as the present worth of a diminishing asset and capitalized the estimated future annual dividends left after a certain sinking fund was deducted from the earnings, an amount that would, if set aside each year and invested at compound interest, replace the valuation at the expiration of the life of the mine. If Mr. Finlay did an injustice to the mining companies in his appraisal, it was in the rates of interest used, the estimated future value of ore, and in the estimated tonnage below bottom level. The last item was corrected by Doctor Leith before the valuations were put on the rolls. It must be taken into consideration that the amount of work done was enormous and the time allowed less than three months.

For the following two reasons, for which Mr. Finlay was not responsible, the mines paid more than their just share of the tax: (1) It will be evident that a valuation thus computed is a full valuation of the mine based on the ore and the profit that can be derived therefrom. Climatic conditions necessitated the stockpiling of ore during the winter months, or else stopping the mine, which would reduce the value of the mine by lowering the output, and be a hardship on the community dependent on the mine. The tax laws demanded a separate assessment of the stockpiles as personal property and they were assessed in addition to the appraisal on the mine. (2) In 1911, while the mines were raised to full valuation, the other property of the counties in which they were situated was not. This resulted in the mines paying much more than their proportion of the taxes for the year 1911.

Since 1911, the State Board of Tax Commissioners has revalued the mines each year, in 1912 employing Doctor Leith and in 1913 and 1914 Dr. R. C. Allen, director of the Michigan Geological and Biological Survey. In 1912, the board assessed all of the property in the four iron counties at full valuation and thus relieved the mines of the heavy overburden they had borne the year before. In 1913, the board changed the interest rates to 6% on both the investment and the sinking fund, on the ground that the sinking fund is not set aside as a separate investment at a low rate of interest, but is either paid out in dividends or reinvested in the mining business. This reduced values slightly. In 1914, they corrected the double taxation caused by the extra assessment of the ore on stockpile, and also made an allowance for hazards that were not considered in the cost of mining.

The board has only been assessing other counties of Michigan at full valuation, and I understand that it is its intention to continue until all the property of the state is assessed as nearly as possible at full cash value. When it comes to assessing the farms of Lower Michigan on this basis, will the board have the power to "put it over"? Or, will public sentiment change and the work be discontinued on the ground that those counties have already placed themselves at full cash value and that the expense is therefore unwarranted?

There have been many hearings on mine valuations held both in Upper Michigan and in Lansing before the state board, and I think the members of the board have come to the conclusion that the mine operators are no more naturally taxdodgers than any other class of people in the state, and that the operators are convinced that the State Board of Tax Commissioners is not actuated by prejudice, but is willing to give the mines a square deal. This spirit carried out cannot but bring good results and be beneficial to all concerned.

The only effect that I can see that the present method of valuation will have on the mining industry is that it may delay the development of ore reserves. There is, of course, enough ore developed to supply the demand for years to come. A mining company is penalized for opening up its reserves, that is, showing its full value. The extra taxes will have to be added to the interest on the cost of developing reserves, as balanced against the value of the knowledge of such reserves. Will not this cause the development of reserves only as needed in the course of mining?

The Strontia Trade

The opportunity for development of the American strontia deposits is pointed out in the December issue of the *Journal of Industrial and Engineering Chemistry:*

Prior to Aug. 1, the refined nitrate was offered in commercial lots at 8c. per lb., but since the above date, the price of the salt has advanced 200%. The commercial demands for strontium nitrate are not so diversified as for certain other chemical products, but the total annual consumption in the United States seems to warrant the American manufacturer entering upon this new field with the confidence that once his market is established, he need no longer fear ruinous competition from the foreign producer.

The principal salts of strontium that appear on the commercial market are, in the order of their importance: Stron-

tium hydroxide, strontium nitrate and strontium chloride. Of the above salts, however, the nitrate is the only one that has been imported in large quantities, but the world consumption of this salt is very small in comparison to that of the hydroxide, which is used in the refining of beet-sugar molasses. So far as is known, the major portion of the nitrate imported annually is consumed in the manufacture of railway signals or Coston lights, and the manufacture of so-called red fire used extensively by the pyrotechnists.

For reasons best known to the continental sugar refiners, the price of the hydrate has never been within the reach of our domestic consumers, but inquiries made among large beet-sugar refiners in this country indicate that there would be a very large consumption of the compound, provided a stable source of supply could be secured.

The conversion of celestite, or strontium sulphate, into soluble strontium compounds, is effected through the reduction of this salt by heating with carbon in rotary furnaces, thus producing the soluble strontium sulphide, from which the hydroxide or nitrate can be readily prepared with suitable reagents.

Generalizations Concerning Economic Geology of the Belgian Congo*

The Belgian Congo, with the exception of the coastal plain, is an ancient plateau which has suffered successive erosional periods, not only in pre-Cambrian and Paleozoic times, but also a particularly important one continuing from late Triassic to Recent time. The thickness of rocks removed must have been very great. Because of this and the fact that no intrusions of post-middle-Carboniferous age (according to Studt's correlation, mid-Devonian) are known to have been important metallic mineralizing agents, it is natural that those metals which, according to present knowledge, are deposited near the surface (mercury, for example), do not occur in important amounts.

The ore deposits of the Katanga Paleozoic rocks, however, are not of deep-seated nature, as these rocks, though in places closely folded, have not been particularly deeply buried. In the pre-Cambrian rocks, however, which form large areas in the Katanga, and greatly predominate among the pre-Permian rocks in other portions of the rim regions, the majority of the ore deposits are of types deposited at great depths, and those later to be found as mining progresses will probably be mineralized quartz lenses, magmatic segregations, sulphide and oxide segregations, and contact metamorphic deposits.

From the rather striking likeness of the pre-Cambrian rocks of the various portions of the colony, it is not surprising that their ore deposits throughout the colony have many points of similarity. The limited bulk of limestone in part accounts probably for the absence of important lead and zinc deposits, although the absence may be more apparent than real, as outcrops of lead and zinc ore are much more apt to be passed over in prospecting than the brilliantly hued surface showings of certain types of copper deposits. The almost complete absence of Tertiary intrusives and the depth of the erosion explain the nonpresence of certain types of silver deposits, and if argentiferous orebodies are later to be found, they will presumably be of intermediate or deep types.

In the northeastern part of the colony the gold mineralization appears to be of pre-Cambrian age, and many of the lesser, commercially unimportant copper deposits, and most of the iron-ore deposits throughout the colony are of similar age; indeed, metallic mineralization, with the exception of the Katanga Paleozoic tin and copper, the Ruwe gold deposits and the recent iron ores, is presumably largely pre-Cambrian. The diamond deposits, at least those of the Katanga, are of post-Permian and perhaps of Cretaceous age.

The flat-lying sandstones and shales of the central basin are without important epigenetic deposits. They may possibly later be proved to contain, locally, lignite and petroleum. Stray colors of gold occur therein, and the placer diamonds of the Kasai region were probably weathered out of certain of their conglomerate beds. The original source of the precious stones, however, must be looked for elsewhere. The Tertiary and Mesozoic sedimentary rocks of the coast are known to contain sandstone with a high bitumen content, but otherwise appear to be barren. The Recent gravels of the rim highlands contain in places concentration of the more resistant minerals, gold, diamonds, monazite, etc.

Although the greater portion of the central Congo basin is of little interest from a mining standpoint, the rest of the country may be considered rather well mineralized. Of particular interest to economic geologists are the Aruwimi-Uelle region in the northeastern part of the colony, the Katanga in the southeastern corner adjoining Rhodesia, and the Kasai-Lovua region in the southwestern portion of the colony.

The analogy between the geology of the Central Africa plateau and of Brazil is close, as pointed out by Cornet, and to an equal extent the mineral resources of the two countries resemble one another. Not only are alluvial diamonds widely distributed over these two regions, but the mineral associations in instances resemble one another. In each country gold deposits are closely associated with hematitic quartzites. Further, there are similarities between iron-ore deposits of the two countries and on the coasts of each occur bituminous sedimentary rocks of more or less importance.

*Excerpt from "Economic Geology of the Belgian Congo, Central Africa," by Sydney H. Ball and Millard K. Shaler, "Econ. Geol.," October, 1914.

Proposed Legal Definition of Vitrification

As clay products which are visibly glassy are practically certain to be overburned and worthless, and as all clay products, whether much or little vitrified, show some portions of glassy maxtrix under magnification, E. Orton (*Trans. Am. Ceram. Soc.*, 1914, p. 497; abstr. *Journ. Soc. Chem. Ind.*) proposes a quantitative absorption test in order to ascertain "vitrification." The definition he suggests for a legal standard is as follows: "Where the word vitrified is used in a contract or agreement as an adjective in describing the properties of a clay product, without further definition in such contract, it shall mean that the product shall have attained in the firing process such a degree of structural density that its mean absorption of pure water will not exceed 3% of its own initial weight, when subjected to absorption tests of 48 hr. complete immersion in cold water or 3 hr. immersion in boiling water. Not less than three tests shall be made in determining the mean absorption, and no single test may exceed the mean by more than 0.5%. Neither the possession of the visual properties or appearance of a glass, nor any definite degree of physical strength, hardness, color, or specific gravity, shall be implied as an attribute of vitrification."

Foreign Mineral Trade of Great Britain

The heavy mineral trade of Great Britain, both imports and exports, was naturally much interrupted and broken up by the disturbed conditions in Europe in the second half of 1914. Comparisons made with 1913 show some marked changes.

Gold imports into Great Britain in 1914 showed a considerable decrease towards the close of the year, the December total being £579,634, or not much over 11% of those of December, 1914. For year ended Dec. 31 the totals were as follows:

	1913	1914	Changes
Imports	£59,533,549	£50,646,642	D. £8,886,907
Exports	46,087,359	30,599,050	D. 15,488,309
Excess, imports	£13,446,190	£20,047,592	I. £6,601,402

Exports to South America, Egypt and India, and of course those to Germany, showed large decreases. Imports from the Transvaal decreased heavily, probably owing to the deposit system adopted by the Bank of England there.

Exports and imports of silver both showed large decreases. The total values for year ended Dec. 31 were:

	1913	1914	Changes
Imports	£14,495,049	£11,950,090	D. £2,544,959
Exports	16,054,679	10,889,075	D. 5,165,604
	Exports	Imports	
Excess	£1,559,630	£1,061,015	.....

The decrease in imports was mainly from the United States and Canada, while that in exports was to India and China.

Silver coinage in the British Mint in 1914 showed a large increase. The total number of silver pieces struck in 1914 was 92,455,843, against 32,296,527 in 1913. The face value of the coins increased from £1,934,354 in 1913 to £6,250,524 in 1914. The increase in face value was proportionately greater than that in number of coins.

Metals and Ores

Imports and exports of metals other than iron and steel in Great Britain for the full year ended Dec. 31 are reported as follows in long tons:

	Imports		Exports	
	1913	1914	1913	1914
Copper	155,485	200,166	72,510	50,774
Tin	45,682	40,961	41,749	44,209
Lead	204,136	224,194	61,993	50,984
Zinc	163,772	128,213	11,076	7,456
Quicksilver	1,518	1,258	898	769
Minor metals	9,805	6,809	26,829	23,931

Exports include reëxports of foreign material. Copper totals include metallic contents of ore and matte imported.

Imports of ores, other than those of iron in Great Britain year ended Dec. 31, in long tons:

	1913	1914	Changes
Copper ore	94,265	71,573	D. 22,692
Tin ore	34,592	32,398	D. 2,194
Manganese ore	601,177	479,435	D. 121,742
Pyrites	781,711	803,065	I. 21,354

Exports of these ores are insignificant, and can be safely disregarded. Of the tin ore in 1914, there were 22,542 tons from South America.

The foreign trade of Great Britain in iron and steel and manufactures thereof for the year ended Dec. 31 is valued by the Board of Trade returns as follows:

	Exports		Imports	
	1913	1914	1913	1914
Iron and steel	£54,291,768	£41,719,422	£15,231,633	£10,865,140
Hardware, etc.	13,358,653	9,520,651	8,965,654	6,439,301
Machinery	37,012,635	31,335,218	7,282,971	6,704,389
New ships	11,026,530	6,824,521	.....	.....
Total	£115,689,586	£89,399,812	£31,480,258	£24,008,830

The quantities of iron and steel exported are given at 4,933,704 long tons in 1913, and 3,888,907 tons in 1914; decrease, 1,044,797 tons. Imports were 2,220,366 tons in 1913, and 1,616,693 tons in 1914; decrease, 603,673 tons. The heavy losses shown were all in the second half of the year and were, of course, due to the war.

Imports of iron ore for the year ended Dec. 31 were 7,442,249 long tons in 1913, and 5,704,837 tons in 1914; decrease, 1,737,412 tons.

Coal

Exports of coal showed a marked decrease month by month from the beginning of the war. In December the exports of fuel—not including bunker coal—were 3,879,393 long tons, against 6,526,307 in December, 1913. For the year the total exports were, in long tons:

	1913	1914	Changes
Coal	73,400,118	59,039,880	D. 14,360,238
Coke	1,235,141	1,182,848	D. 52,293
Briquettes	2,053,187	1,607,757	D. 445,430
Bunker coal	21,031,550	18,535,579	D. 2,495,971
Total	97,719,996	80,366,064	D. 17,353,932

The total decrease was 17.8%. The imports are insignificant, only 24,029 tons in 1913, and 44,572 tons in 1914, an increase of 20,043 tons in the latter year.

On the Composition of Bat Guano

Owing to the many inquiries received at the Journal office as to bat guano, the following analyses reported by C. F. Miller, of the Bureau of Soils (*Journ. Ind. Eng. Chem.*, August, 1914), seem of interest:

BAT GUANO ANALYSES

Results in Percentages, based on Air-Dry Sample

Source of Sample	N	P_2O_5	K_2O	Volatile
Near Carlsbad, N. M.	4.24	2.31	1.28	....
Guadeloupe Mts., N. M.	1.77	2.68	0.41	40.00
Torreon, N. M.	10.82	1.08	1.01	....
Oregon County, Mo.	8.10	2.06	0.58	....
San Juan, P. R.	1.00	3.40	0.21	....
San Juan, P. R.	0.50	2.40	0.29	....
El Fondo, Santo Domingo	11.84	4.80	1.61	....

The large variations are attributable either to foreign matter, such as rock débris and the like, or to removal of the more available constituents by leaching. In the more recent deposits, nitrogen is the most valuable constituent, phosphoric acid and potash following in the order given, but on aging, the nitrogen content decreases rapidly. The sample from Santo Domingo represents practically uncontaminated and undecomposed guano.

The Hanyehping Iron & Coal Co., Ltd., commonly known from its chief plant as the Hanyang Iron Works, has coal mines at Pinghsiang, Kiangsi Province, and iron mines at Tayeh, Hupeh Province. The Hanyehping company, the Japanese Iron Works and the Yokohama Specie Bank entered into joint agreements in the spring of 1914, according to a recent consular report, by which the bank was to lend the Chinese company about $7,500,000, to be redeemed within 40 years through the sale of iron ore and pig iron to the Japanese Iron Works. In March, 1914, the Hanyehping shareholders agreed to the proposed joint control of the company by the management and the Chinese Government. Practically all the pig iron exported in 1913 went to Japan. The Hanyang Iron Works are now in full operation; but owing to the contracts with the Japanese, the prospects for increased shipments of iron ore to the United States are not promising. The blast furnaces, which were partially destroyed during the revolution of 1911, have been repaired and a new furnace is being installed. The output of the Hanyang Iron & Steel Works during 1913 was as follows: Pig iron, 97,633 tons; steel, 41,961 tons; steel rails, 16,743 tons. The production of coal at the Pinghsiang mines amounted to 579,633 tons in 1913, compared with 232,373 tons in 1912; that of coke to 174,665 tons in 1913. The output of iron ore at the Tayeh mines was 192,980 tons in 1912 and 485,865 tons in 1913. The projected railway construction in the district is creating such a demand for rails that the entire output of pig iron of this company, after satisfying the Japanese pig-iron contract, must be used in producing rails for the Hukuang Railways.

Finding the Judson Orebody

By L. E. Ives*

SYNOPSIS—Discovery of iron orebody near Crystal Falls, Mich., on which Judson and Balkan mines have been opened. Geological conditions, preliminary investigations. First drilling exploratory. This followed by systematic outlining of the ore.

One of the most important events in the recent history of Michigan iron mining was the discovery by the E. J. Longyear Co. of the Judson orebody near Crystal Falls. Five years ago the property was a swamp containing some long abandoned exploration pits, trenches, etc., and so far as anyone knew, or cared, apparently, nothing else. The district had received a black eye, having been turned down by one of the large companies operating on the Lake Superior ranges, which had drilled it to some extent, but had found nothing. Today, as the result of scientific exploration, the Balkan and Judson mines are stockpiling from a deposit known to be extremely large.

Geology

The Menominee region comprises the Iron River, Crystal Falls and Florence districts, and the old Menominee range proper. The region was at one time the scene of volcanic activity. The lava flowing in great rivers into the adjacent sea, formed deltas of volcanic muds and sands. In time volcanic action ceased and the muds were solidified, some under water and some above water.

Accompanying the laying down of these muds and sands, a chemical deposition of iron-bearing cherts occurred, forming lenses at several different horizons in the mud mass. Later the muds and sands were consolidated into slates and graywackes and the iron formations were hardened. In subsequent geologic periods, intense folding took place and the whole was brought up as a land mass. From then on, circulating waters concentrated portions of the iron-bearing lenses, producing local orebodies of iron ore. In recent geologic times, the ice sheet covered the country and on its retreat left a mantle of moraine of varying thickness, a light veneer in some portions, but heavy in others.

Previous mining and exploration work on the Menominee range had proved conclusively that the lenses of iron-bearing formation are contained in the Upper Huronian slates. However, all the slate does not necessarily contain the iron-bearing formation, nor is all iron-bearing formation merchantable ore. The problem is: Given the slates, to find first the iron-bearing formation, and then that concentrated portion of it which constitutes merchantable ore.

Preliminary Investigation

In 1909, certain interests controlling the fee of over 100,000 acres of cut-over lands in Iron, Dickinson, Baraga and Marquette Counties in Michigan, conferred with a well known geologist, thoroughly conversant with Lake Superior geology regarding the advisability and methods of exploring these lands for iron ore, and arrangements were subsequently completed whereby a thorough geological examination of the lands was made.

The geological field work consisted of examining each 40-acre tract for geological data and making a magnetic survey. Any old trenches, test pits, shafts, adits or other abandoned mining operations were carefully mapped, sampled and recorded, and information was obtained from all possible sources that had any bearing on the lands in question. Old drill-hole data were examined, and this whole mass of information was arranged, classified and embodied in the maps that were made of the various parcels. Whenever warranted, the magnetic work was extended, and the scale of the map increased to show as close readings as seemed desirable.

The area now containing the Balkan and Judson mines was finally selected for drilling because of the proximity of three old abandoned mines. The evidence procured from these, the Alpha, Delphic and Mastodon, while meager, was conclusive on these points: Some ore had been found in them, though of questionable grade; the area was in the Upper Huronian slates. The early explorations at the

Drilling for the Judson Orebody

Alpha had consisted of two drill holes and two shafts, 50 and 110 ft. deep. Here ore of various grades up to 60% iron had been found. It was difficult to mine because it occurred in small seams, but it showed conclusively the presence of iron formation. The Delphic had been opened in 1880 and closed in 1887, not a long life as Michigan iron mines go these days. From it had been shipped 30,730 tons of nonbessemer ore, running from 55 to 60% iron, on which a royalty of 50c. per ton had been paid. The orebody, however, was reported to have pinched out at a rather shallow depth. The last drilling had been done by other interests in 1907 and no continuation of the orebody was found.

Preliminary Drilling

Having selected the land to be drilled, the next thing was to spot the first hole. In work of this sort, the selection of a site for the first hole is largely a matter of judgment; in most cases it is scarcely more than a feeler. A glance at the map will show the lands in question and their position relative to the three old mines. Hole No. 101 was finally selected as the first hole, be-

*Chicago editor, "Engineering and Mining Journal."

cause its site was on a strike through the old Alpha pit, and the intention was to continue drilling toward the southeast until the appropriation was exhausted, unless definitely positive or negative results were obtained sooner.

Ore was first found in hole No. 126, and 25 holes had been drilled between this and the first one. No attention should be paid to the series of holes numbered 600, as these were drilled later in connection with the mining operation and had no connection with the exploratory work. By the time hole No. 126 had been reached, the drilling had cost about $40,000.

A Fortunate Discovery

The crucial point of the campaign occurred just before hole No. 126 was started. The first appropriation had been almost exhausted and up to this point no merchantable ore had been found, although iron formation over 600 ft. wide and running up to 40% iron had been encountered. Here a discovery was made that turned into success what would probably otherwise have been failure. The supposition had always been that the direction of bedding was approximately northwest and southeast. This fact, supposedly determined by the early mining operators, apparently had been passed along by successive geologists. This theory had been followed in the new drilling, in the expectation of connecting the Alpha and Mastodon workings. It was finally proved that previous explorers had confused bedding and jointing and by following the bedding around a fold, the correct direction of the bedding was found to be northeast and southwest. Based on this new theory, hole No. 126 was spotted and the result was the finding of the ore.

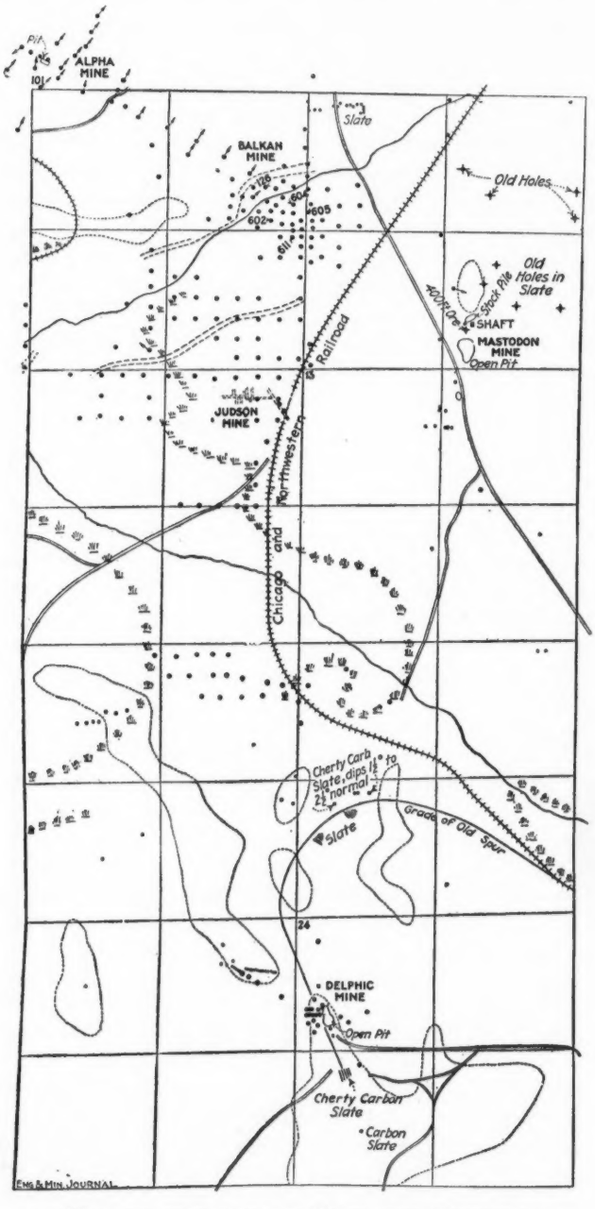
Delimiting Orebody with Vertical Holes

After ore had first been found in hole No. 126, the problem changed to that of delimiting the orebody and estimating its contents. In this work, as in that of actually finding the ore, although perhaps to a less extent, the position of the various holes depends greatly upon results found in preceding holes. And in this connection, it should be remembered that the general procedure on the Mesabi range is to drill all holes more or less according to a predetermined plan, usually consisting of staking out a 40-acre tract in squares and drilling vertical holes at the corners of these squares. This procedure is satisfactory on the Mesabi, because of the vast amount of such work that has been done there, the general proximity of opened properties from which valuable data may be secured, and the fact that the orebodies usually extend over a 40-acre tract in a flat bed of varying thickness, below an overburden that may be anywhere from 1 to 100 ft. thick. Most of the exploratory work on the Mesabi also can be done with churn drills.

The Michigan orebodies are different. The ore itself is harder, the deposits assume the form of lenses and tabular bodies dipping at various angles; and they are generally surrounded by harder rocks. These conditions necessitate the extensive use of the diamond drill. In the case of the Judson orebody, however, the first few holes and the surface topography indicated an orebody of such dimensions that, in proportion to the tract under exploration, it was thought Mesabi conditions would be approximated. At this point, furthermore, the commercial aspect of the work assumed great importance. And since, from a business standpoint, the prime object was to outline an orebody, vertical holes were decided on; these were placed at the corners of 200-ft. squares. Eventually the ore was outlined and the necessary information obtained for estimating its size.

Estimating the Ore

In estimating orebodies on the Lake Superior ranges, practice has developed two methods: (1) Using cross-



Map of the Judson Find and Vicinity

sections through the holes; and (2) using surface area and average depth. Both methods are in general use on the Mesabi, but the second method is somewhat new practice for the Michigan ranges, due probably to the dissimilarity of the orebodies. In this case both methods were used.

It should be remembered that there is a sharp distinction between estimating the tonnage of merchantable ore in a given tract, and computing the valuation of a property based on the tonnages of the various grades of

ore it contains. The former is a rather simple arithmetical problem, while into the latter there enter many factors, such as mining cost, royalties, taxes, prevailing ore prices, etc. The valuation of such an orebody is too large a subject to attempt consideration here.

Summary of Work Done

The total amount of drilling on the Judson Mining Co.'s property was 52,338 ft. in 117 holes. It was done with Longyear Nos. 1 and 2 hydraulic diamond drills, which bore what the company calls an "E" hole, $1\frac{9}{16}$ in. in diameter, and which produce a $\frac{5}{8}$-in. core. The No. 1 drill has a capacity of 1000 ft. and No. 2 drill, 2000 ft. In carrying on this work, which extended over three years, the drills in use varied in number from 2 to 10; the maximum number of men employed was 50 to 60.

A sludge box was also developed in connection with this drilling, which was described in the JOURNAL, Mar. 28, 1914, p. 660. On this particular work, the holes were surveyed only by the hydrofluoric-acid method. The magnetic-needle method was not used because the local zones of attraction, due to the magnetic slate in the vicinity, would have rendered the results useless. The majority of holes, furthermore, were vertical and not over 1000 ft. deep.

Scientific Exploration

The casual operator will say this was luck. So it was—to the extent that luck in varying degree enters into all exploratory and mining operations. But there was much more to it than luck. The entire undertaking was based on scientific principles, and the campaign was carried out carefully along that line. And scientific exploration may be described as the bringing to the work in hand all available information on the geology of the land involved and on previous mining operations or explorations in the vicinity, together with the expenditure of well directed thought by trained men and of some money for carefully conducted drilling, before actual opening work is performed, in the effort to avoid the expenditure of larger sums in wasteful and useless ground-breaking. It is an effort to make trained intelligence do what it would cost more to do with a drill, and to make the drill do what it would cost more to do with shafts, drifts and crosscuts. Repeated successes are bringing it increased popularity.

Income-Tax Ruling: Gross Value at the Mine

The following ruling has been handed down by Commissioner Osborne in regard to mining-company income, according to the *Commercial and Financial Chronicle*:

"Gross value at the mine," as contemplated in that provision of the Federal income tax law which authorizes mining companies to deduct from gross income an amount to take care of depletion of natural deposits, is held to mean the gross price at which the product could be sold at the mine; that is, its actual bona fide market value.

The term "gross" as applied to "value" contemplates the aggregate value of the product at the mine determined upon the basis of the market conditions at the time and place, and is best defined as the price at which the product sells or would sell when delivered at the mouth of the mine in a marketable condition. Five per cent. of the value thus determined will constitute the maximum amount which a mining corporation may deduct under the Federal income tax law from gross income on account of depletion of natural deposits. This does not contemplate that the full 5% of the gross value will be allowed if the aggregate amount calculated at a less rate will equal the cost in place of such deposits or secure to the corporation the return of its capital when the deposits have been exhausted.

Influence of the European War on the Mining Industry of Dutch Guiana

By F. B. Percival*

The European war is having a disastrous effect on the mining industry of Dutch Guiana, especially among the classes which depend entirely on the gold they mine to keep themselves and their families together. The influence of the conflict is so strongly felt in the colony that misery and starvation are the order of the day.

The mining industry kept about 7000 people employed, and through them quite a respectable sum of money was always in circulation. It is hard to say how long the cessation of business will last, but the government of the colony has adopted measures whereby the suffering may be alleviated, at least for a time.

The majority of miners operate on their own account. They work at what is locally called "pork knocking." The proprietors of concessions lease to these people, for three months, a piece of land for mining purposes. They are obliged to sign a contract of agreement before the chief of police, agreeing to pay to the concessionaire 15% of all gold mined on the concession, and to deliver all gold to the owner of the land, who only has the legal right to sell it, deduct the 15% and return the remainder.

To obtain a contract is easy work, but the miner must have money or credit to enable him to purchase his outfit. In only about one out of a hundred cases the man has capital. The rest are therefore obliged to seek credit from a merchant who will supply the outfit and wait for three or more months before the miner returns to town and pays the bill. However, the "pork knocker" is an honest sort, works hard, and in the majority of cases not only pays his bills, but clears a respectable sum upon his return to town. Since the war broke out, however, the United States exporters demand cash on delivery of all foodstuffs coming to the merchants of Dutch Guiana. Formerly the merchants had time to pay their obligations, and therefore could very well extend the same consideration to their miner customers. Now there is nothing doing and the miner, not having any savings to fall back upon, is beggared.

At the present time there are only four mining companies operating in the colony. Of these, two are run by United States capital, the others by English. They have their own permanent employees and have no openings for the unemployed "pork knockers." Work along other lines is scarce. The balata industry is also a victim of the war, and the plantations for the greater part have closed down.

Last year promised to be a record one for the gold industry. At the outbreak of hostilities the production up to July 31 stood at 2,714,664 grams, and most of the ground gave promise of rich returns, weather conditions being normal. The new mining regulations, which are ideal, passed their final reading in the local parliament in July and are now law. The mining industry promised well and but for the war would have become the principal industry of the colony.

*Paramaribo, Dutch Guiana.

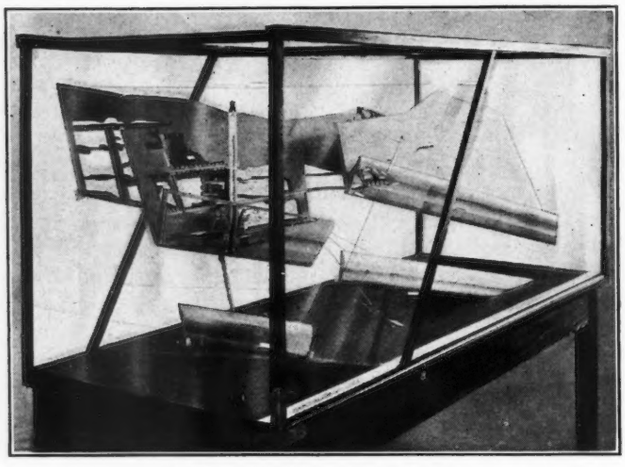
Details of Practical Mining

The Mt. Hope Mine Model

By J. C. Stockland*

At Mount Hope, N. J., the Empire Steel & Iron Co., of Catasauqua, Penn., is operating a magnetite iron mine. The longitudinal shrinkage method of stoping has been adopted and the entire plant modernized by the installation of electrical equipment.

The formation at the Mt. Hope mine consists of a series of parallel, steeply dipping oreshoots cut by a fault having approximately 400 ft. of vertical throw. The mine workings lie on both sides of the fault; the oreshoots are fairly regular, continuous, and opened up to such an extent as to permit of the construction of a model believed to have features of clearness, simplicity and ease of manipulation not ordinarily realized in the conventional construction of mine models.



Model of Mt. Hope Mine

The dimensions of the ground to be included in the model having been determined from the mine plans and sections, allowance was made for future probable advance and a scale of 50 ft. to the inch adopted as the most convenient. The longitudinal limits of the model were represented by two rectangular plates of selected double-thick glass mounted vertically at the extremities of a table. The fault plane was represented by a similar plate of glass cut to the average inclination and strike of the fault. A light wooden framework was then built around the whole and well reinforced by heavy brass plates to make the structure self-supporting and at the same time leave the spaces between the glass plates free for the work to follow.

The cross-section of any given oreshoot is approximately constant throughout its known length, so that for the purposes of the model an average section was taken and the shoot assumed to be uniform. As a matter of fact, slight variations in thickness are common, but they would be difficult to represent. These average cross-sections plotted to scale were then transferred to the ends of soft, white-pine boards built up of strips 1½ in. wide by 6 in. long, glued together edge to edge with the grain of the wood reversed in adjoining strips to minimize warping. The whole length of the board was then dressed down to the uniform section of the shoot, when it was ready to be mounted between the glass plates. This was done by taking sections across the whole formation at the two extremities of the model and at the fault plane, transferring these sections to the respective glass plates, and fitting the boards in position between the corresponding sections, using bits of glass and transparent adhesive cement to secure them in place. Care was taken to so arrange the bits of glass as to admit of the ready removal of the boards for subsequent addition or alteration.

The various workings in the ore were then outlined on the boards, the mined-out portions cut out with a scroll saw and the remainder painted a color as near to the natural shade of the ore as possible. Where the shoots intersect the surface they were cut away to conform to the contour of the land, and the outcrop lines painted white, while the walls of all drifts and raises in the ore were painted a bright yellow. Crosscuts, shafts and other workings in rock were fashioned to scale out of wood and fixed in place with dowels and painted yellow to correspond to the passages in the ore. Finally, typewritten labels giving the name and code numbers of the workings were pasted on in their proper places and fine copper wires fixed in position to represent the more important diamond-drill holes.

As will be seen in the photograph, only the actual orebodies are represented in the model, the intervening country rock being left to the imagination. This facilitates the work of keeping the model up to date from month to month, and by coloring in the portions representing the monthly advance or extraction, estimates and comparisons can be quickly and easily made. A model of this kind is also useful in that it enables those not familiar with mining to readily form an idea of the location of the mine and workings and the geologic relation of the orebodies to one another.

*Mining engineer, Empire Steel & Iron Co., Catasauqua, Penn.

Concrete-Block Mine Houses*

The Witherbee-Sherman Co. at Mineville, N. Y., houses its employees in company dwellings. During the past eight years no wooden houses have been built. Instead, concrete blocks made from the tailings of the concentrating plants have been used. The interior floors and partitions are wood and the roofs of slate. The concrete blocks are 8x10x20 in.; each occupies 0.92 cu.ft. of wall space. It costs 15c. to make a block, of one part cement and six parts tailings, this cost including sprinkling and piling for seasoning; 10c. additional covers the expense of hauling, handling and laying in the wall,

*Excerpt from an article by S. LeFevre, "Bulletin of the American Institute of Mining Engineers," February, 1915.

making the blocks cost 25c. each in the wall. No charge is made for the tailings, and the blocks are made at the foot of the tailings pile. They are mixed and tamped by hand and made in a Century block machine. The 10-in. blocks have a 4-in. air space in the middle. On one of the first houses the experiment was tried of plastering the inside wall directly on the concrete blocks, but this was a failure, as water ran down the walls in streams; not due to moisture coming through the concrete-block wall, but to the condensation of moisture from the heated air inside coming into contact with the cold surface of the block wall. To remedy this trouble 1-in. strips were nailed to the blocks, to which wooden laths were nailed and the wall was replastered.

Reinforced-Concrete Shaft Sets

By L. D. Davenport*

The Oliver Iron Mining Co. has erected a concrete plant at Hibbing, Minn., for the purpose of making building blocks, shaft sets, slabs and similar products for use at its new mines on the Mesabi range.

The plant is near the company's office and adjacent to the carpenter, blacksmith and machine shops. The structure is a frame building covered with corrugated sheet iron. It is 115 ft. long over all and consists of a main plant, 24x57 ft., four stories high, and a one-story shed 46x91 ft., divided into drying and steam rooms.

The sand and rock for the concrete was brought in stripping cars from one of the openpit mines and dumped close to the plant. This material as needed is trammed in a small car over a low trestle to the crusher.

From the crusher a belt conveyor carries the crushed material to a trommel at the top of the plant, where it is sized and deposited in three bins as shown in the flow sheet. A 30-hp., 200-volt, Westinghouse motor runs the crusher, the trommel and the conveyor belt.

The cement is brought to the plant in railroad cars over a trestle at the elevation of the charging floor and is unloaded and stored under the bins conveniently near the charging car. Below the bins is a track carrying a wedge-shaped charging car which is divided into compartments for sand, rock and cement. The charging car dumps directly into a No. 1 Smith mixer, water being added from a tap close by. This charging car is also used to tram the oversize from the screens to a chute leading back to the crusher.

From the mixer the concrete is taken to one of three chutes by a transfer car of the same pattern as the charging car except that it is not divided into compartments. One of the chutes feeds the Denver block machine and the other two supply the various forms placed below them. All blocks are cured in the steam room and the shaft sets are either sent to the steam room or are dried in the main shed, which is steam heated. The finished product is taken from the trucks and piled or loaded on freight cars by means of an air lift of about five tons' capacity, running on an overhead crane.

A 1:4 mixture of cement and sand is used in the blocks and a 1:2:4 or a 1:2:3 in the shaft sets.

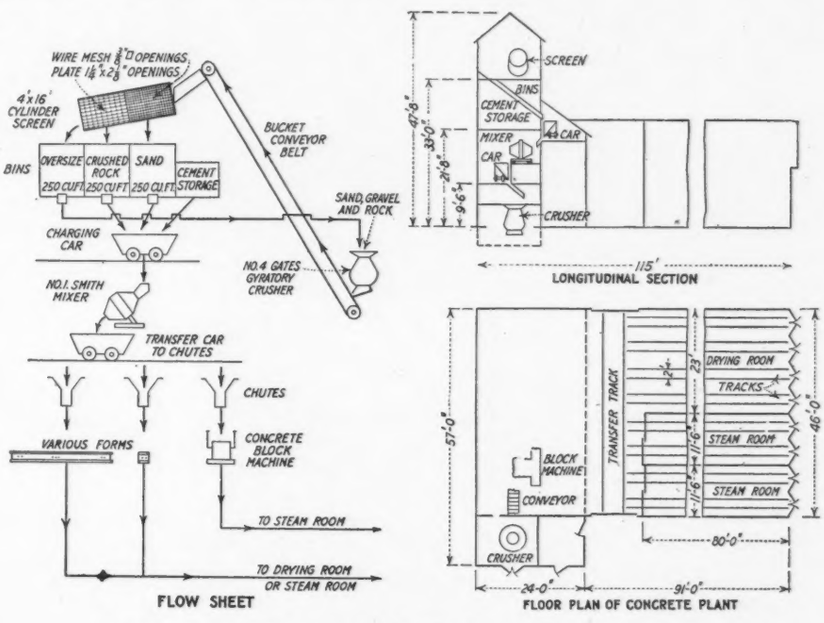
Three complete shaft sets, i.e., six wall plates, six end plates, six dividers, 24 studdles and 156 slabs for lagging, and from five hundred to seven hundred 9x24-in. building blocks constitute an average day's output under favorable conditions.

Shaft Sets Cast in Forms

The concrete shaft sets are cast in forms built up of steel plates and angles with all holes cored tapering about 1/8 in. larger than the bolts to be used. A 1:2:4 mixture was used at first, but this was changed to a 1:2:3 in order to obtain a smoother product. The concrete is made wet and puddled in the forms rather than rammed.

The wall plates and end plates are 12x12 in., and the dividers are 10x12 in. The corner studdles are 10x10 in. and the center studdles are 8x10 in. The studdles being 4 ft. long, the sets are spaced on 5-ft. centers.

The general style of framing is the same as for the standard wood-lined shaft 6x18 ft. inside, with the exception of a few details as follows: A 2x2-in. cleat spiked in the center of the outside of the wooden sets makes a bearing for the lagging, while the upper and lower outside edges of the concrete sets are rabbeted 1½x3 in. to hold the concrete lining slabs.



Method of Handling Material at Manufacturing Plant

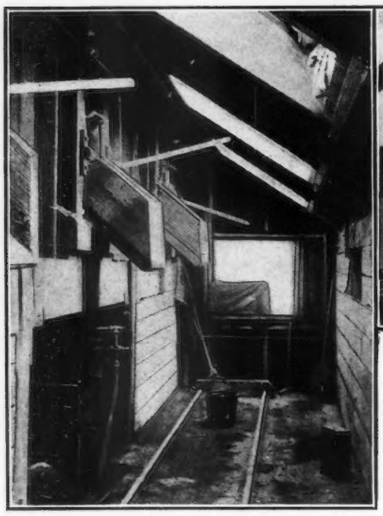
The shaft is hung from four steel crossbearers which in turn rest on two reinforced-concrete longitudinal bearers about 2x3 ft. in cross-section and 34 ft. long. These were cast in place just below the surface of the ground from the outside of the shaft. The crossbearers at each end of the shaft are each made up of two 15-in., 33-lb. channels 19 ft. long. Those at the dividers are single 15-

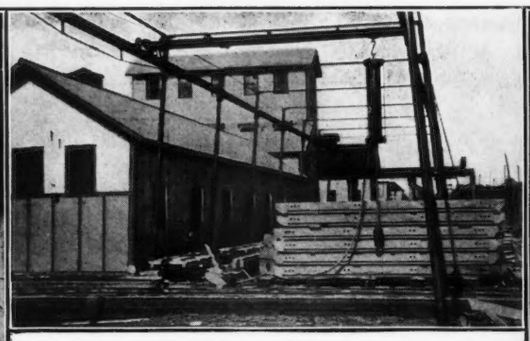
*Assistant chief engineer, Oliver Iron Mining Co., Hibbing district, Minn.

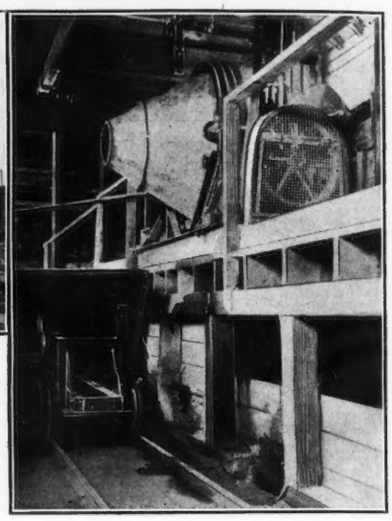
in., 42-lb. I-beams of the same length. The shaft collar including all the shaft above the first bearers was cast in one piece with 12-in. outside walls and 10-in. dividers.

The placing of the first two or three sets directly below the bearers presented a slightly different problem from the ordinary timbered shaft on account of the solid concrete collar section above the bearers. In a timbered shaft the dividers are left out of the collar set until the next two or three sets below have been hung. With a 6- or 8-ft. monolithic collar section including the dividers, there is not room to lower and swing into place the 20-ft. wall plates for the next two or three sets except by sinking 18 or 20 ft. without timber. This difficulty was overcome by driving a 2x3-ft. flat incline from the surface to a point just under the crossbearer at one end of the shaft. The concrete timbers were slid down this incline and hung in place until the shaft was sufficiently deep to allow lowering in the ordinary manner.

The skip guides are of wood and are fastened to the end pieces with $3\frac{1}{2}$x$\frac{7}{16}$x7-in. angles and to the dividers by $7\frac{1}{2}$-in. lengths of 10-in., 25-lb. channels. All ladderway sollars are $\frac{5}{16}$-in. hob steel plates with steel toe-boards of 2x2x$\frac{3}{8}$-in. angles around the ladder openings and of 5x$3\frac{1}{2}$x$\frac{3}{8}$-in. angles on the pipeway side.

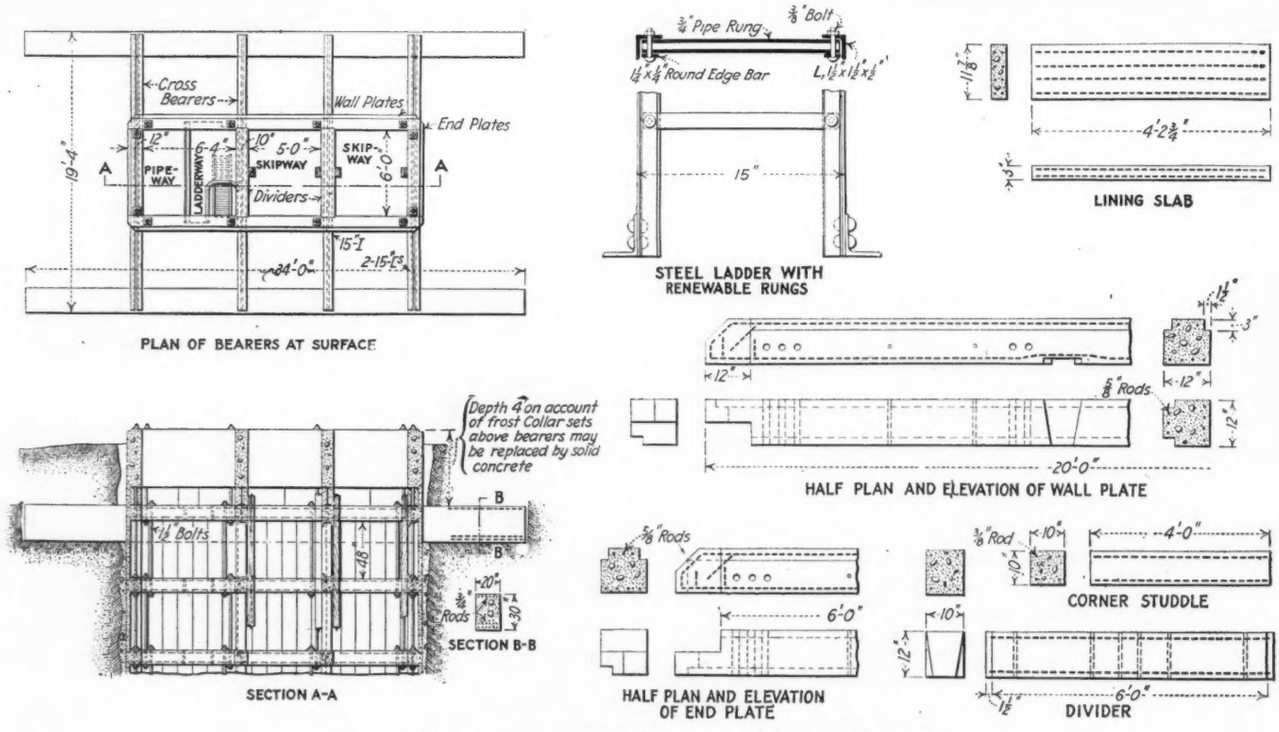






THE MANUFACTURING PLANT

On left, the charging floor. Above, outside of plant showing crane, air lift and wall plates ready for shipment. On right, Smith mixer and the distributing car.



SHAFT ARRANGEMENT AND DETAILS OF SHAFT MEMBERS

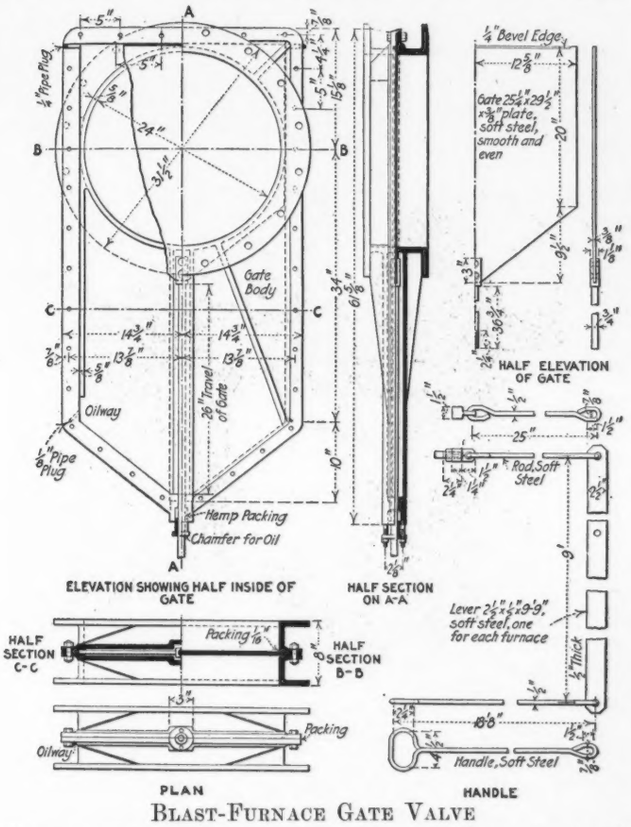
The ladders are made of $1\frac{1}{2}$x$1\frac{1}{2}$x$\frac{1}{2}$-in. angles with $\frac{3}{4}$-in. pipe rungs spaced 10-in. centers. Two pieces of $1\frac{1}{4}$x$1\frac{1}{4}$-in. flat iron cover the ends of the rungs and are held by $\frac{3}{8}$-in. bolts through the rungs and angles. The ladders are about 24 ft. long and extend 4 ft. through the sollars to the under sides of the sets above, making excellent hand holds. The ladderway is separated from the skipway with a No. 26A galvanized reinforcement mesh.

Details of Milling and Smelting

A 24-In. Gate Valve for Blast Furnaces

By Percy E. Barbour*

The accompanying sketch shows details of construction of the 24-in. gate valves used in the blast pipes at the furnaces of the Tennessee Copper Co. The levers, hangers



Blast-Furnace Gate Valve

Valve operates normally in upright position, but is placed as shown for convenience in lettering

and operating handles are also shown. These valves are easily operated to cut the blast instantly and have stood the test of time as to desirability of design.

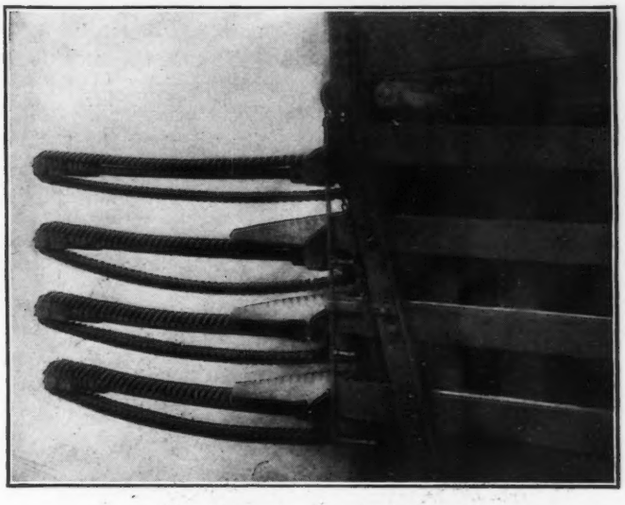
Turning a Camshaft Pulley

To turn down or crown a camshaft pulley, the regular driving belt is replaced by a temporary one 3 in. wide. The tool holder is removed from a lathe and bolted to the floor in front of the wheel. The face can then be turned down or crowned, the steel-cutting tool taking care of any nails that may appear on the surface of the pulley. The narrow belt can be shifted from place to place as the face of the pulley is turned, and thus kept out of the way. In this manner camshaft pulleys can be refaced, or crowned, without any great trouble, and without removing them from the shaft.

*Mining engineer, 887 Middle St., Bath, Me.

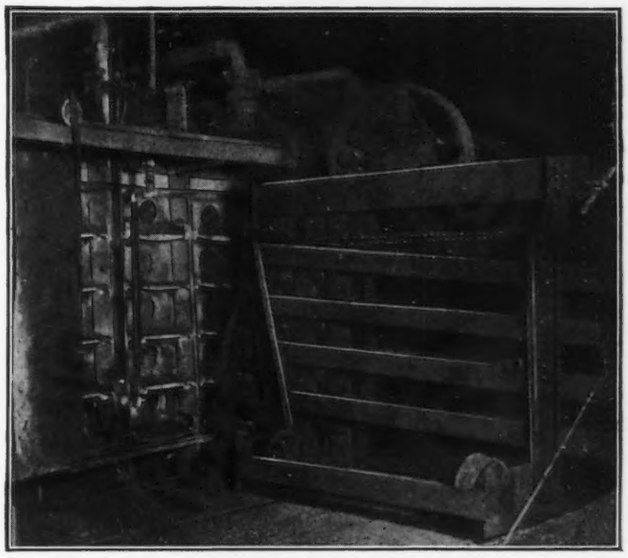
Simmonds' Retort-Discharging Machine*

The Simmonds' retort-discharging machine seems to mark an important step in zinc metallurgy. As can be



Belt Scrapers Extended

seen from the almost self-explanatory illustrations, the apparatus consists of a large number of endless chains carrying scrapers, which enter the mouths of a number



Emptying a String of Retorts

The stream of discharged ore can be seen just to the left of the machine

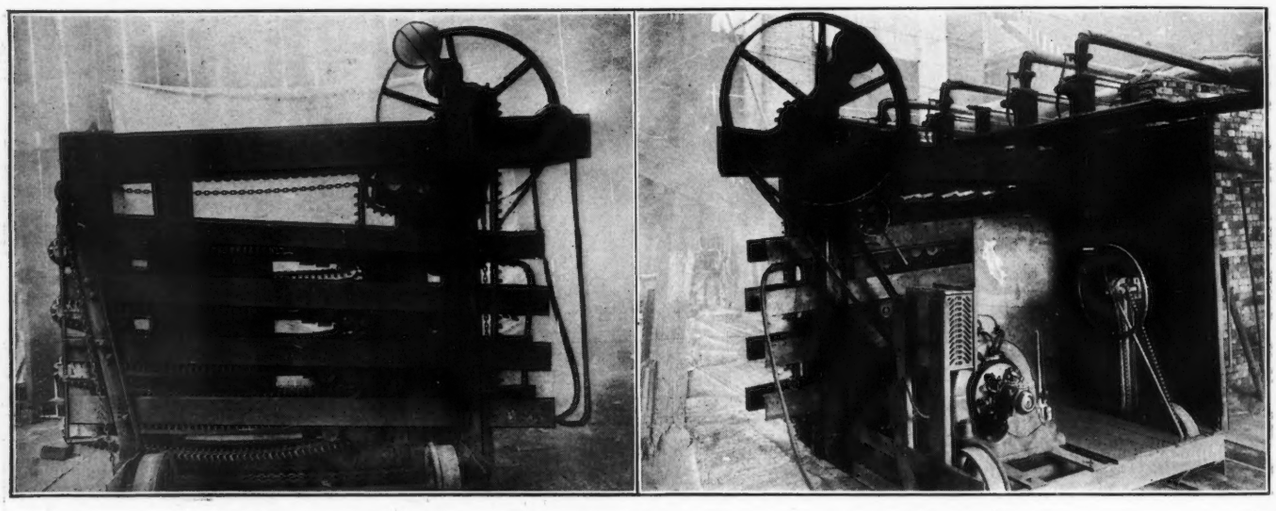
of zinc retorts simultaneously and scrape out the residue. At the same time the cleaning elements are advanced into the retorts, until the back of the retort is

*From data furnished by the Simmonds Engineering Co. of Iola, Kan.

reached. This apparatus is mounted on a car running along a track in front of the zinc furnace whereby the scrapers can be adjusted to clean out any given vertical row of retorts.

The drive for the scrapers and that advancing or retracting the train of scrapers as a whole is entirely independent. Motion is communicated to them by one of the sprockets over which the chain-belt scraper train runs. A hand controlling device is ordinarily supplied for reversing the dirction of this feed, but it can also be done automatically.

The machine is placed in position before a string, or vertical row, of retorts, and put in motion. The scrapers, on entering the mouths of the retorts, have a freedom of motion which allows them an angular swing upward, to climb over the heap of residue, then as the residue is scraped out, they follow the material. A stop screw, however, prevents angular motion below a certain point, so that there is no danger of going through the bottom of the retort. The retorts are then emptied, the scraper trains retracted and the entire machine run along on its track to the next string of retorts, which are treated similarly. Movement along the rails is either by means of a motor, or by a handwheel, the former used for the main motion, the latter for small adjustments.



General Views of the Simmonds' Retort Discharging Machine

The average time of the cycle of operations is 45 sec.: 5 sec. to move the plungers to the mouths of the retort; 25 sec. to discharge them; 10 sec. to withdraw the plungers; and 5 sec. more to move the entire carriage to the next string. This speed can be maintained during the entire cleaning of a furnace, and the apparatus is said to be able to handle a very slaggy residue.

The scrapers and links are cast-steel, one-piece, and are said to wear well. The chains are sprayed with water, which effectually protects them. To prevent the material scraped from the retorts falling on the scraping mechanism working on retorts lower down, there is a chute provided for each plunger which deflects the falling residue. These chutes are pressed forward by springs against the retort during the cleaning operation. On the withdrawal of the scraper mechanism from the retort these chutes are caught by hooks and drawn back, to allow the apparatus to be moved ahead.

Ash Troubles in Dust Firing

For many years the ash bugaboo kept copper metallurgists from trying coal-dust firing for their reverberatory matting furnaces. It has been the general impression that this was the reason that coal-dust firing was not continued at Cananea. When coal-dust firing was tried at Coppercliff, the Canadian Copper Co.'s metallurgist, David H. Brown, decided to use straightaway flues and to place the skimming door at the side, instead of at the end of the furnace, largely to be prepared for anticipated ash troubles. When working on cold charges, some difficulty was experienced with the ash clogging the flue at the throat of the furnace, but this difficulty disappeared when hot calcines were used and the furnace was smelting rapidly. Now the ash trouble is negligible.

It is interesting to have a corroboration of this from Anaconda. Louis V. Bender states[1] that the ash gives little trouble. The flue connection between furnace and boiler is cleaned once a day, requiring the labor of two men from four to six hours each day. It was found easier to keep the flue clean when using coal containing 22% ash than when using coal containing 9% ash; this difference was due to the physical characteristics of the ash; in the first case the ash was light and fluffy, while in the second case it tended to sinter. Approximately one-half of the ash of the coal floats on top of, or is absorbed by, the slag and does not noticeably interfere with the work of the furnace. Little of the ash goes into the boiler and the boiler tubes are cleaned no oftener than are those connected with the grate-fired furnaces. In September, 1914, when 1984.77 tons of coal dust were burned in smelting 14,272 tons of charge, there was taken from the flue 85.54 tons of ash and flue dust. The Diamondville coal used during this month contains about 8% ash.

It is worthy of note that no difficulty was experienced in using a coal giving 20% of ash. In fact, Lochray coal having 20.9% of ash was tried and actually gave less trouble than Diamondville coal, as the former ash was light and fluffy and showed no tendency to sinter. The Lochray coal will be used at Great Falls when the reverberatories there are remodeled for coal-dust firing.

[1] "Bull. of A. I. M. E.," Jan., 1915.

Spelter Statistics for 1914

By W. R. Ingalls

SYNOPSIS—Revised statistics of spelter production in the United States in 1914 and four years previous. Statistics of ore supply by states. Analyses of figures according to the classes of smelting plants, by periods of the year, etc.

Revised and complete statistics of the zinc industry in 1914 are given in this article, reports having been received from all of the ore smelters. Reports from the dross and scrap smelters are only partially complete, however, and the production of their class of spelter is estimated on the basis of partial returns, but reports were missing only from a few of the smaller concerns. Certain smelters who treat both ore and dross are included with the ore smelters.

PRODUCTION OF SPELTER

(In tons of 2000 lb.)

By Ore Smelters

States	1910	1911	1912	1913	1914
Colorado	6,564	7,477	8,860	8,637	8,152
Illinois	79,570	88,681	94,902	111,551	130,587
Missouri-Kansas	112,182	106,173	111,761	85,157	53,424
Oklahoma	34,760	46,333	76,837	83,230	92,467
East	43,989	47,172	56,278	69,687	77,731
Totals	277,065	295,836	348,638	358,262	362,361

By Dross and Scrap Smelters

1910	1911	1912	1913	1914
11,350	(a) 13,500	(a) 15,000	(a) 20,500	(a) 18,000

Total Production of Spelter

	1910	1911	1912	1913	1914
Ore smelters	277,065	295,836	348,638	358,262	362,361
Dross smelters (a)	11,350	13,500	15,000	20,500	18,000
Totals	288,415	309,336	363,638	378,762	380,361

(a) Estimated. It is difficult to obtain reports from all of these smelters. The large increase in production from 1912 to 1913, as here reported, was due in part to a more complete statistical accounting.

SPELTER PRODUCTION IN 1913 AND 1914 BY QUARTERS

(Reports of Ore Smelters Only)

(In tons of 2000 Lb.)

District	I	II	III	IV
1913				
Illinois	27,924	28,523	26,118	28,986
Kansas-Missouri	22,006	23,820	19,204	20,127
Oklahoma	21,430	21,840	18,502	21,458
Others (a)	20,722	20,153	19,238	18,211
Totals	92,082	94,336	83,062	88,782
1914				
Illinois	31,005	32,482	32,512	34,588
Kansas-Missouri	13,939	14,659	13,193	11,533
Oklahoma	22,563	22,960	22,945	23,999
Others (a)	20,700	20,703	21,819	22,661
Totals	88,207	90,804	90,469	92,881

(a) With the exception of one plant in Colorado these are all Eastern works.

Production—The total production of spelter by ore smelters in 1914 was 362,361 tons, of which 8380 tons was derived from galvanizers' dross, skimmings, scrap, etc., and the remainder from ore. The production from dross, skimmings, scrap, etc., was 8764 tons in 1913; 7447 in 1912; 9030 in 1911; and 7793 in 1910. These data do not include the production by concerns which treat dross and scrap only, whose output amounts to about 20,000 tons per annum.

Ore Smelted—The smelters who treated ore reported that in 1914 they smelted 628,886 tons of blende and 226,549 tons of calamine. It should not be attempted to draw too fine deductions from these figures respecting the average yield of the ore smelted, some smelters having apparently reported "ore received" as "ore smelted." In those cases where a discrimination was made the figures showed differences between the quantities of "ore received" and "ore smelted," reflecting increases and decreases in the ore stocks at smelting works. The total report of "ore smelted" was 855,435 tons, and of "ore received" 872,767 tons. This was partly due to the stocking of the new works at Langeloth and Tiltonville, but even without that there was a surplus of ore receipts, which was the more noteworthy in view of the suspension of Butte & Superior shipments for two months.

The ore statistics show accurately, however, the relative proportion of blende and calamine smelted. With the exception of the Palmerton plant of the New Jersey Zinc Co., which smelts chiefly the willemite concentrate of Franklin Furnace, N. J., the bulk of the calamine ore was smelted by works in the gas fields of Kansas and Oklahoma. One large plant was operated exclusively with calamine. The smelters east of the Mississippi River make sulphuric acid, with the exception of two small concerns, and naturally use blende, but some of them take relatively trifling quantities of calamine.

RECEIPTS OF ZINC ORE

(In tons of 2000 lb. This table includes the receipts of ore by the smelters only and does not include the production of ore exported or what was taken by the manufacturers of zinc oxide.)

State	1910 (a)	1911 (a)	1912 (a)	1913	1914
Arizona	7,568	6,395	11,937	9,347	6,357
Arkansas	190	860	1,567	1,500	1,737
California	(d)	3,754	6,639	6,796	8,827
Colorado	77,065	158,528	212,423	220,166	164,739
Idaho	10,248	9,667	19,482	31,835	57,001
Kentucky	179	575	947	441	434
Missouri-Kansas	289,913	268,500	289,177	280,000	247,723
Montana	33,514	56,593	34,034	91,257	125,663
Nevada	4,915	5,666	20,654	22,313	20,447
New Mexico	15,959	10,184	25,889	14,593	15,369
Oklahoma	1,640	8,750	4,325	23,500	26,247
Tennessee	2,775	3,439	6,635	8,297	18,708
Utah	27,318	19,933	24,539	27,073	20,322
Wisconsin (b)	51,383	71,565	90,762	89,662	74,311
Others	46,905	44,896	56,099	57,241	57,936
Totals	569,572	669,305	805,109	884,021	845,821
Mexico	29,198	28,596	29,436	19,965	16,414
Canada	11,795	2,356	9,707	6,012	10,532
Grand totals (c)	610,565	700,257	844,252	(c)909,998	872,767

(a) Smelters' receipts: reports missing from three small smelters. (b) Including Illinois and Iowa. (c) In addition to the ore reported from Canada and Mexico, zinc smelters received a few thousand tons from Europe and Eastern Siberia in 1913. (d) Included in "Others."

With the movement of the zinc-smelting industry to the eastward, the separation of blende roasting and zinc distillation is becoming more marked, as it has been for a long time in Europe. It is often good business to roast the blende at a good center for the distribution of sulphuric acid and reship the roasted ore to a good point for zinc distillation. The Western Chemical Co. has for a long time roasted ores at Denver, Colo., and sold the roasted ore to other smelters. The National Zinc Co. has no roasting furnaces at its smeltery at Springfield, Ill., which gets its ore from the roasting plant of the company at Argentine, Kan. Similarly the Grasselli Chemical Co. roasts at Canton, Cincinnati, Newcastle, Cleveland and Grasselli the ore that is needed by its smelteries at Clarksburg and Meadowbrook. The New Jersey Zinc Co. has a roasting plant at Tiltonville, Ohio, which supplies other smelters.

The table showing ore receipts gives the totals of ore reported as taken in by the smelters. This is not equivalent to the ore production of the several states, inasmuch as ore that went to the zinc-oxide plants at Coffeyville,

Kan., Mineral Point, Wis., and Palmerton, Penn., is not included. For this reason the ore received by the smelters of spelter was considerably less than the outputs of Colorado, New Mexico, Wisconsin and New Jersey (included in "other states"). With those exceptions, however, the figures in the table probably correspond closely with the productions of the several states.

The ore statistics have some noteworthy features. Several states exhibit important increases in 1914 notwithstanding the low average price for spelter (5.06c., St. Louis, compared with 5.50c. in 1913 and 6.80c. in 1912). In Montana the Butte & Superior company made an increased output, although it suspended production from Oct. 18 to Dec. 19. Timber Butte, a new and important producer, began operations June 1. In the Coeur d'Alene district of Idaho the Interstate-Callahan mine became a large producer. The increased output of Tennessee was due especially to the mine of the American Zinc, Lead & Smelting Co. in the Holston River district. The Yellow Pine district of Nevada, which produces calamine ore, fell off a little in output.

Leadville, the chief zinc-producing district of Colorado, made about the same production in 1914 as in 1913. The Leadville *Herald-Democrat* gives these figures: 52,689 tons of blende and 157,286 tons of calamine in 1913; 204,427 tons of blende and calamine in 1914. These figures show only a slight decrease from 1913 to 1914, which does not agree with the Colorado ore receipts reported by the smelters. The latter show a large decrease.

The zinc-ore production of the Joplin district declined on account of the low range of prices, at which many of the "sheet-ground" mines could no longer be worked profitably and were therefore abandoned. Considering the conditions it is perhaps surprising that the Joplin production did not show a larger decrease.

The outputs of both Wisconsin and Oklahoma increased, according to local statisticians, but smelters' receipts showed a decrease in Wisconsin and only a slight increase in Oklahoma. It is possible that the discrepancy in the case of Wisconsin would be explained by returns from the oxide works. In the case of Oklahoma, some of the ore originating there was doubtless reported by the smelters as coming from the Joplin district and was entered with the figures from Missouri and Kansas. In Wisconsin 46 mills and five magnetic-separating plants were in operation at various times during the year. In Oklahoma the only active mining district was Miami. Improvements in the methods of ore concentration there led to the production of blende concentrate assaying 60% Zn and as low as 2% Fe.

In New Mexico the Magdalena district was the chief producer of zinc ore, and in Utah the major part came from the mines at Park City.

The production of floated blende concentrate in 1914 was nearly 100,000 tons. In this connection let it be noted that the mills employing the flotation process produce a large proportion of jig and table concentrate as well as the floated froth. The production of floated concentrate is without doubt destined to increase materially during the next year or two.

Bonded Spelter—In 1914 there was produced 5630 tons of spelter in bond. In 1913 the production in this way was 5904 tons; in 1912 it was 10,879 tons; in 1911 it was 9598 tons; and in 1910 it was 3398 tons. The exports of bonded spelter are stated in an accompanying table.

Spelter Production According to Fuel—Of the total spelter production of the ore smelters in 1911, concerns using coal as fuel produced 119,989 tons, or about 40% of the total. In 1912 they produced 134,077 tons, which was only about 38% of the total. In 1913, their production was 157,653 tons, or about 44% of the total, and in 1914 it was 173,520 tons, or about 48% of the total. The remainder of the production was made by smelters using natural gas as fuel, with the exception that one employs a little crude petroleum along with natural gas.

Dross and Scrap—The amount of the recovered spelter that should properly be counted statistically is uncertain. A good deal of scrap zinc is remelted in the manufacturing plants where it is made, e.g., in every rolling mill, and such remelted zinc should not, of course, appear in any statistical enumeration. On the other hand, certain smelters buy and redistill and subsequently sell as spelter, often of excellent quality, what was distinctly a waste product. This is obviously an addition to the new supply of spelter and should be recognized just as is that which the ore smelters recover from dross, skimmings, etc. In my estimate I have conformed to this reasoning.

A point that deserves note is the increasing production of spelter from dross and the decreasing exports of that material. In 1911, the exportation was 2446 tons; in 1912 it was 205 tons; and in 1913 it was only 28 tons. But in 1914 the exportation of dross jumped to 2525 tons, domestic production of dross-spelter being correspondingly less. I estimate the product redistilled from dross, skimmings, etc. (by works treating this material only), at 13,500 tons in 1911, 15,000 tons in 1912, 20,500 tons in 1913, and 18,000 tons in 1914; and probably these figures are underestimates rather than overestimates. In taking a statistical view, this spelter must be added to the spelter obtained otherwise, it being sold in the same way.

Adding to the reports of the dross smelters the metal made by ore smelters out of dross, skimmings, etc., there was a total recovery of 26,230 tons of secondary spelter in 1914, compared with 29,264 tons in 1913.

Zinc Dust—The production of commercial zinc dust in 1914 was 1042 tons, compared with 423 in 1913; 492 in 1912; and 254 in 1911. In 1913 only two smelters were engaged in this manufacture; but when the outbreak of the war in 1914 cut off America's foreign supply and the price rose from about 6c. per lb. to 15@16c., several additional smelters engaged in the manufacture of it. The importation of zinc dust was 2302 tons in 1914, compared with 2200 in 1913; 2400 in 1912; and 1713 in 1911.

Spelter Stocks—Fifteen smelting companies reported by telegraph stocks on Dec. 31 aggregating 19,500 tons. Six companies reported works idle. Three companies, one very small, failed to report their stocks. Estimating 4000 tons for them, the total stock in the hands of smelters on Dec. 31 was 23,500 tons. The stocks at the ends of previous years are reported in an accompanying table. According to the government statistics, the stock at the middle of 1914 was 64,000 tons.

Sulphuric Acid—In 1914 there were nine smelters who produced sulphuric acid from blende, the American Zinc & Chemical Co. being an addition to the list. The

statistics of the works of this class for a series of years are given in an accompanying table. It is to be remarked that although the American Zinc & Chemical Co. produced acid in 1914 it did not produce spelter, its distillation furnaces not being completed and its roasted ore being stocked.

STATISTICS OF SPELTER-SULPHURIC ACID WORKS

(In tons of 2000 lb.)

	1910	1911	1912	1913	1914
Ore received	.....	.....	287,205	364,741	434,666
Spelter produced	100,791	115,310	127,655	148,188	196,529
Sulphuric acid, basis 60°	202,000	252,192	262,555	305,167	355,424

As in previous years, the smelters who made sulphuric acid drew their main ore supply from the Joplin district, and from Wisconsin, Oklahoma and Tennessee, whereof the ore supply is mainly a high-grade and relatively pure blende. In 1911 these smelters received 107,995 tons of blende from the Joplin district and 71,168 from Wisconsin; in 1912 they received 117,806 and 87,676, respectively; in 1913 they received 159,540 and 84,495, respectively; and in 1914 they received 179,237 and 74,311, respectively. Oklahoma and Kansas are reckoned with the Joplin district and Illinois and Iowa with Wisconsin.

These statistics indicate the predominance of the sulphuric-acid makers in the markets for the pure, high-grade ores. They take all the blende of Wisconsin and Tennessee, which they command geographically, and the major part of the production of the Joplin district, out of which their competition has practically forced the Kansas and Oklahoma smelters, of whom the Edgar Zinc Co. is the only large buyer of the best sorts of Joplin ore.

It is noteworthy that some of the Eastern smelters are using increasing supplies of Rocky Mountain ores.

Smelting Capacity—The capacity of the zinc-smelting works of the United States at the end of 1914 is given in an accompanying table. Among the active plants, Sand Springs was new in 1914, having begun production in the third quarter. The list is classified according to (1) active plants; (2) plants that are maintained in working order but which are of uncertain future; (3) inactive plants; and (4) new plants building.

At the end of 1914 returns from nearly all of the plants of class 1 indicated that about five-sixths of this capacity was then in use. All of the plants of classes 2 and 3 were idle, and had been so during most of 1914. Of the two plants in class 4 that at Langeloth had just put its first furnace in operation, while the new Granby plant was understood to be nearly ready to run.

Among the plants of class 1 the Matthiessen & Hegeler Zinc Co. was the only one having new capacity in preparation, this building a new furnace of 912 retorts. Among the plants of class 4, the American Zinc & Chemical Co. had 1728 retorts building.

In 1914, about 362,000 tons of spelter were produced in 22 works using about 83% of their capacity. Old works if operated at full capacity were consequently able to produce about 56,000 tons more of spelter than in 1914. In addition thereto there was a new plant of 17,500 tons capacity (terms of tons of spelter) immediately available, and furnaces of nearly 11,500 tons capacity in construction and so far advanced as to become available early in 1915. There were also two inactive plants possessing a capacity of about 10,000 tons. I do not include the moribund works of Kansas, which may or may not be put into use. They had a capacity of about 62,000 tons.

The United States possesses therefore, or very soon will possess, first-class capacity for the production of 445,000 tons of spelter per annum; and second-class capacity amounting to 72,000 tons additional that may be used in emergency. These figures take no account of the dross and scrap smelters.

The estimate of a maximum capacity for 517,000 tons of spelter must be discounted, however, being based on the average yield in a year of low price when the ore treated was probably of a relatively high grade. The high price for spelter will draw out lower-grade ore and the average yield per retort will be lower. Moreover, the roasting capacity of American smelters is materially short of their distillation capacity, which means that they may not be able to attain the maximum use of their distillation furnaces unless they can secure all the calamine ore that they need, and calamine ore is generally of lower grade than blende. It is best not to undertake to draw fine points, but simply to assume that the smelting capacity of the United States is largely in excess of any use of it previous to the end of 1914.

ZINC SMELTING CAPACITY OF THE UNITED STATES

(Number of Retorts at End of Years)

Name	Situation	1913	1914
	Active		
American Zinc Co., of Ill.	Hillsboro, Ill.	3,200	4,000
Bartlesville Zinc Co.	Bartlesville, Okla.	5,184	5,184
Bartlesville Zinc Co.	Collinsville, Okla.	8,064	8,064
Clarksburg Zinc Co.	Clarksburg, W. Va.	2,712	1,824
Edgar Zinc Co.	St. Louis, Mo.	2,000	1,100
Edgar Zinc Co.	Cherryvale, Kan.	4,800	4,800
Granby Mining & Smg. Co.	Neodesha, Kan.	3,760	3,840
Grasselli Chemical Co.	Clarksburg, W. Va.	5,760	5,760
Grasselli Chemical Co.	Meadowbrook, W. Va.	6,912	6,912
Hegeler Zinc Co.	Danville, Ill	1,800	(d) 1,800
Illinois Zinc Co.	Peru, Ill.	4,640	4,640
Robert Lanyon Zinc & Acid Co.	Hillsboro, Ill.	1,600	1,840
Lanyon-Starr Sm. Co.	Bartlesville, Okla.	3,456	3,456
Matthiessen & Hegeler Zinc Co.	La Salle, Ill.	5,256	5,256
Mineral Point Zinc Co.	Depue, Ill.	6,800	9,080
National Zinc Co.	Bartlesville, Okla.	4,480	4,260
National Zinc Co.	Springfield, Ill.	3,200	3,200
New Jersey Zinc Co.	Palmerton, Penn.	5,760	5,760
Prime Western Spelter Co.	Gas City, Kan.	4,768	4,768
Sandoval Zinc Co.	Sandoval, Ill.	896	896
Tulsa Fuel & Manufacturing Co.	Collinsville, Okla.	6,232	6,232
Tulsa Spelter Co.	Sand Springs, Okla.	.....	4,000
United States Zinc Co.	Pueblo, Colo	1,920	1,920
Totals		93,200	98,592
	Operated Irregularly		
Altoona Zinc Smelting Co.	Altoona, Kan.	3,300	(b) 3,840
American Zinc, Lead & Smg. Co.	Dearing, Kan.	3,840	(a) 3,840
American Zinc, Lead & Smg. Co.	Caney, Kan.	3,648	(b) 3,648
Chanute Zinc Co.	Chanute, Kan.	(b) 1,280	(a) 1,280
La Harpe Spelter Co.(c)	La Harpe, Kan.	1,856	(b) 1,856
Totals		13,924	14,464
	Inactive		
Collinsville Zinc Co.	Collinsville, Ill.	(b) 1,536	(a) 1,536
Pittsburg Zinc Co.	Pittsburg, Kan.	(b) 910	(a) 910
Totals		2,446	2,446
	New		
American Zinc & Chem. Co.	Langeloth, Penn.	.....	864
Granby Mining & Smg. Co.	E. St. Louis, Ill.	.....	3,240
Totals			4,104
Grand totals		109,570	119,606

(a) Inactive throughout year. (b) Inactive during latter part of year. (c) Plant being dismantled. (d) No report received; entered the same as last year.

Imports and Exports—In 1914 there was a larger exportation of spelter than ever before in the history of the United States, the total being 70,242 tons, including 5580

IMPORTS AND EXPORTS, BY QUARTERS

Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	3,355	500,253	1,288,259
II	4,727	512,123	1,256,559
III	6,849	664,012	535,161
IV	31,329	83,191	1,524,128
Year	46,260	1,759,579	4,604,107
Exports	**Ore, Long Tons**	**Spelter, Lb.**	**Dross**
I	2,883	842,465	572,477
II	4,297	769,560	0
III	1,319	48,280,632	1,239,570
IV	1,421	90,591,936	3,239,020
Year	9,920	140,484,593	5,051,067

tons of spelter smelted in bond. The government figures of the exportation of bonded spelter are a little different from those reported by the smelters. However, this is explained by difference of the period comprised within the respective reports.

The government reported the importation of 28,050 long tons of zinc ore in 1913 and 46,260 long tons in 1914. The former figure checked with the smelters' reports of receipts; the latter is much in excess thereof. This difference may be in part explained by an increased supply of incoming ore not yet received by the smelters at the end of 1914.

The exports of zinc ore from the United States dropped from 15,815 long tons in 1913 to 9920 long tons in 1914. This was due chiefly by the impossibility of exporting New Jersey willemite to Belgian and German smelters after the outbreak of the war.

Deliveries—Estimated deliveries are given in an accompanying table. Deliveries are computed by difference between (*A*) stocks, plus production, plus imports, and

DELIVERIES FOR CONSUMPTION

	1910	1911	1912	1913	1914
Stock, Jan. 1	11,506	23,000	9,323	4,264	40,115
Production	288,415	309,336	363,638	378,762	380,361
Imports	3,452	1,637	11,115	6,100	880
Totals	303,367	333,973	384,076	389,126	421,356
Exports, domestic	3,989	6,872	6,634	7,782	64,802
Exports, foreign	4,468	11,270	8,700	6,526	5,580
Stock, Dec. 31	23,000	9,323	4,264	40,115	23,500
Deliveries	271,892	316,508	364,488	334,703	327,474

(*B*) exports plus stocks, but experience shows how futile it is to attempt to compute consumption in that way, and how important a part is played by the stocks in the yards of galvanizers and brass makers, the invisible supply.

The statistics in the table of deliveries are incomplete because of their omission of stocks held by dross smelters. Moreover the statistics of stocks and exports, the former reported by the smelters as what was at their works and the latter reported by the government as what was shipped abroad from our ports, do not register exactly. The exports reported in December would register approximately with the stock at the end of November, at which time the stock at smelteries was undoubtedly higher than at the end of December. In other words the deliveries in 1914 computed by the only method available, which is admittedly imperfect, are probably larger than in fact they were.

Remarks—The revised report of the production of spelter in 1914 is 1672 tons more than was reported in the ENGINEERING AND MINING JOURNAL of Jan. 9, 1915. The increase is due to an underestimate for the smelter who did not report for the preliminary statistics, while several of the other smelters who estimated their output for the last 15 days of 1914 actually made a little more than they expected.

Deducting from the total production the amount that was derived from dross and skimmings, and adding 90% of the production of zinc dust, the zinc yield of 855,435 tons of ore smelted in 1914 was 41%, corresponding to average grade of 47½% Zn for the ore, assuming an average extraction of 86%. We do not possess corresponding figures for 1913 and therefore can not make any comparison. In view of the low price prevailing in 1914 it is not an unreasonable surmise that the average grade of the ore coming to the smelters was higher than usual. The decrease in ore receipts indicates that the miners felt the pinch of low prices. Even so there was less ore smelted than was taken in, which is easily explained in part by the necessary accumulation of stocks at two new smelting works. The large increase in imports of ore in the fourth quarter and the difference between the government report of imports and the smelters' reports of foreign receipts indicate that a large quantity of foreign ore was in transit at the end of the year. The exports of spelter in December amounted to the huge figure of 20,192 tons, as reported by the government.

A surprising feature of the statistics for 1914 is the large proportion of calamine smelted in this country. Not requiring roasting this is a particularly desirable class of ore for the smelters of Kansas and Oklahoma whose gas supply is scanty.

The statistics of imports and exports by quarters reveal some of the interesting effects of the war in the cases of spelter, dross and ore exports and zinc-dust imports.

February Mining Dividends

Dividends paid in February, 1915, by 20 United States mining companies making public reports amount to $2,182,338, as compared with $2,004,300 paid by 21 companies in February, 1914. Industrial and holding companies allied to mining paid $8,175,267, as compared with $9,309,427 in 1914. Canadian and Mexican mining companies paid $689,474 in 1915, as against $909,050 in 1914.

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g	Alas	$0.20	$36,000
Alaska Treadwell, g	Alas.	1.00	200,000
Alaska United, g	Alas.	0.30	54,060
Arizona, c	Ariz.	0.18	277,001
Bunker Hill & Sullivan, l.s	Ida.	0.25	81,750
Bunker Hill Con. g	Calif.	0.02½	5,000
Caledonia, l.s	Ida.	0.02	52,100
Duluth & Utah, l.s	Utah	0.04	2,000
Golden Cycle, g	Colo.	0.05	75,000
Goldfield, g	Nev.	0.15	533,872
Hecla, l.s	Ida.	0.01	10,000
Homestake, g	S. D.	0.65	163,254
May Day, g.s.l	Utah	0.02	16,000
Mohawk, c	Mich.	1.00	100,000
Parrott, s.c	Mont.	0.15	34,477
Shattuck-Ariz., c	Ariz.	0.50	175,000
South Eureka, g	Calif.	0.05	14,999
Stewart, s.l	Ida.	0.10	123,826
United Verde, c	Ariz.	0.75	225,000
Yellow Aster, g	Calif.	0.03	3,000
Iron, Industrial and Holding Companies	**Situation**	**Per Share**	**Total**
Amalgamated, c	U. S.	$0.50	$1,154,159
Cambria, pfd	Penn.	0.62½*	562,500*
International Nickel	N. J.	1.50	133,689
U. S. Steel, pfd	U. S.	1.75	6,304,919
White Knob, pfd	Calif.	0.10	20,000
Canadian, Mexican and Central American Companies	**Situation**	**Per Share**	**Total**
Amparo, g.s	Mex.	$0.03	$60,000
Buena Tierra, s.l	Mex.	0.24	80,190
Conigas, s	Ont.	0.30	240,000
Dominion Steel	N. S.	1.50	105,000
Hollinger, g	Ont.	0.20	120,000
Lucky Tiger, g	Mex.	0.10	71,534
Rea, s	Ont.	.....	12,750

*Scrip.

Shattuck-Arizona resumed dividends after having passed its previous quarterly disbursement. Rea's dividend is its initial payment.

Butte & Superior Copper Co., Ltd.

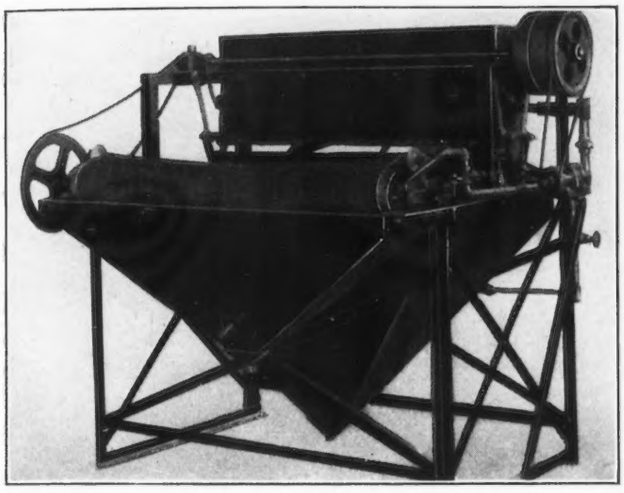
The report of this company for the fourth quarter of 1914 shows that 33,520 tons of ore, containing 19.45% zinc and 8.928 oz. silver per ton were milled. The mining cost was $3.288 per ton and the milling cost $2.466 per ton. The low tonnage was due to a wreck in the shaft, which made retimbering necessary, consequently the operation was cut off between Oct. 17 and Dec. 17. The percentage of total zinc recovered in concentrates during the

operating period was 84.65. The total zinc in concentrates was 11,039,557 pounds.

Profit for the quarter was $251,786, based on an average price of 5.012c. per lb. for spelter, and net operating profit was $252,051. Development work amounted to a total of 2242 ft. Many improvements to plant and surface development were made during the period when the plant was shut down.

The Wood Flotation Machine

The accompanying engraving from a photograph shows the type of flotation apparatus designed by Henry E. Wood & Co., of Denver, Colo. (previously described in the JOURNAL), which has been shipped to the San Francisco Del Oro mine, near Parral, Chihuahua, Mexico. In experimental work in Denver very satisfactory results were obtained in the treatment of the difficult San Francisco Del Oro ore by this apparatus.



THE WOOD FLOTATION MACHINE

Brick from Flotation Tailings at Anaconda

At the recent A. I. M. E. meeting in New York, E. P. Mathewson exhibited a brick that had been made from tailings of the experimental flotation plant, and announced that the Anaconda company would shortly go into the manufacture of such brick, having already ordered machinery having a capacity of 50,000 brick per day.

The brick exhibited had a clear ring, was exceedingly fine grained, without a heat crack, and had much the appearance of a gray pressed brick, well suited for building-face brick. It had been tested to 15,000 lb. per sq.in. and was in other respects superior to the ordinary pressed brick. Owing to its composition, it could be used as a firebrick, the tailings from which it was made being high in silica and alumina.

These brick will be made from material much of which is ground to 200 mesh—the discharge from the slime-tailings flotation plant. From 2000 to 2500 tons of this material will be discharged daily, but only about one-tenth of these tailings will be required by the brickmaking machinery now ordered, so that it will be possible to supply any demand that may arise in the territory that can be covered from Anaconda.

Superior & Boston

The report of the Superior & Boston Copper Co., Copper Hill, Ariz., for the year ended Sept. 30, 1914, states that the company had been operating on a producing basis throughout the year until the war in Europe necessitated the discontinuance of ore shipments in August. During the period 25,625 tons of ore were produced for which the company received $291,515; other receipts brought the total to $293,236. Total expenditures were $309,218, making an excess of $15,982 over receipts which was made up from the balance carried forward from 1913, thereby leaving a balance of quick assets amounting to $59,285 at Oct. 1, 1914. It is stated that aside from a few hundred tons of ore which came from the 600 level east from the Quo Vadis fault, all ore mined came from the ground lying between the McGraw and Quo Vadis faults and between the 600 and 800 levels. There were 5424 ft. of development work and 563 ft. of diamond drilling performed during the year.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

AMALGAMATING MACHINE. Matthew Arnold, San Jose, Calif. (U. S. No. 1,127,845; Feb. 9, 1914.)

AMALGAMATOR. John A. Macdonald, Boston, Mass. (U. S. No. 1,128,024; Feb. 9, 1915.)

CHLORIDIZING ROASTING of Ores. Arthur Ramén and Knut Jakob Beskow, Helsingborg, Sweden. (U. S. No. 1,129,123; Feb. 23, 1915.)

CLASSIFIER. Robert H. Richards, Boston, Mass. (U. S. No. 1,129,522; Feb. 23, 1915.)

COBALT-SILVER ORES—Process for Treating Cobalt-Silver Ores. William Phillips, Swansea, Wales. (U. S. No. 1,127,506; Feb. 9, 1915.)

CONCENTRATION—Improvements in and Relating to Apparatus for Ore Concentration. A. H. Higgins, W. W. Stenning and Minerals Separation, Ltd., London, Eng. (Brit. No. 21,650 of 1913.)

CRUSHER. Charles S. Lincoln, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,128,015; Feb. 9, 1915.)

CRUSHING—Process of and Apparatus for Crushing Ore. Hans Charles Behr, Scarsdale, N. Y. (U. S. No. 1,127,853; Feb. 9, 1915.)

DRILL—Rock Drill. George R. Bennett, Denver, Colo. (U. S. No. 1,127,396; Feb. 9, 1915.)

DRILLING—Fluid-Operated Drilling Machine. Louis W. Greve, Cleveland, Ohio, assignor, by mesne assignments, to Cleveland Rock Drill Co., Cleveland, Ohio. (U. S. No. 1,129,347; Feb. 23, 1915.)

DRILLS—Relief Valve for Rock Drills. Thomas E. Sturtevant, Dover, N. J., assignor to McKiernan-Terry Drill Co., Dover, N. J. (U. S. No. 1,127,823; Feb. 9, 1915.)

EXCAVATING MACHINE. Charles B. King, Marion, Ohio, Grant Holmes, Danville, Ill., and Benjamin Jacoby and Herbert E. Roush, Marion, Ohio, assignors to The Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,128,151; Feb. 9, 1915.)

GOLD SEPARATOR. Dirk Hoogendorn, Deering, Alaska. (U. S. No. 1,129,678; Feb. 23, 1915.)

MAGNETIC SEPARATOR. Georg Ullrich, Magdeburg, Germany, assignor to Fried. Krupp Aktiengesellschaft, Grusonwerk, Magdeburg-Buckau, Germany. (U. S. No. 1,129,822; Feb. 23, 1915.)

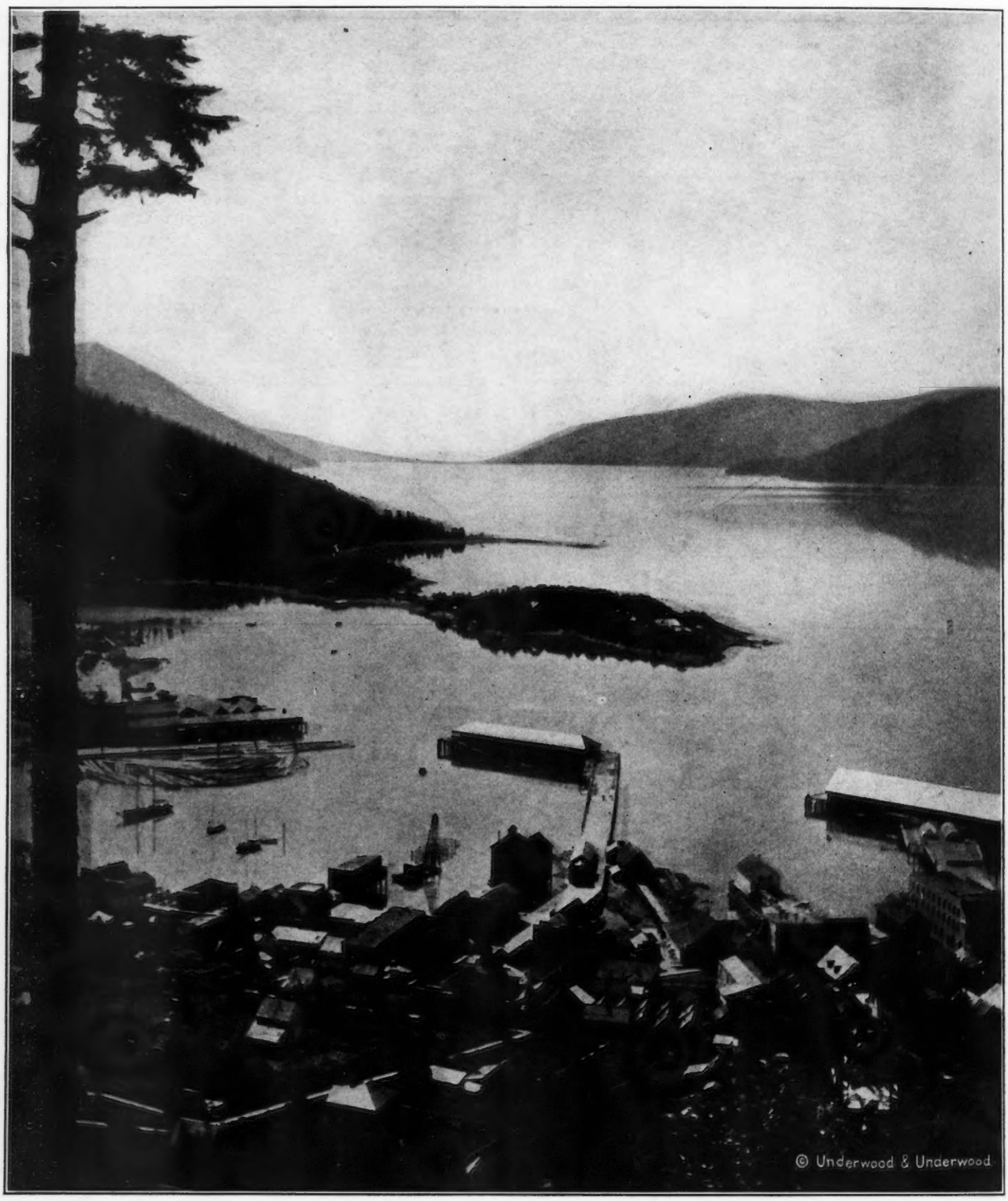
METALLIC COATING—Method of Plating or Coating with Metallic Coatings. Max Ulrich Schoop, Höngg, near Zurich, Switzerland, assignor, by mesne assignments, to Metals Coating Co. of America, Boston, Mass. (U. S. No. 1,128,059; Feb. 1, 1915.)

PHOSPHATE ROCK—Process of Treating Pebble Phosphate Rock. William F. Lay, Boston, Mass. (U. S. No. 1,129,407; Feb. 23, 1915.)

PLACER CONCENTRATING MACHINE. John F. Newsom, Palo Alto, Calif. (U. S. No. 1,127,667; Feb. 9, 1915.)

SILICON—Process of Making Silicon Compounds and By-Products. Samuel Peacock, Chicago, Ill., assignor to International Agricultural Corporation, New York, N. Y. (U. S. No. 1,129,506; Feb. 23, 1915.)

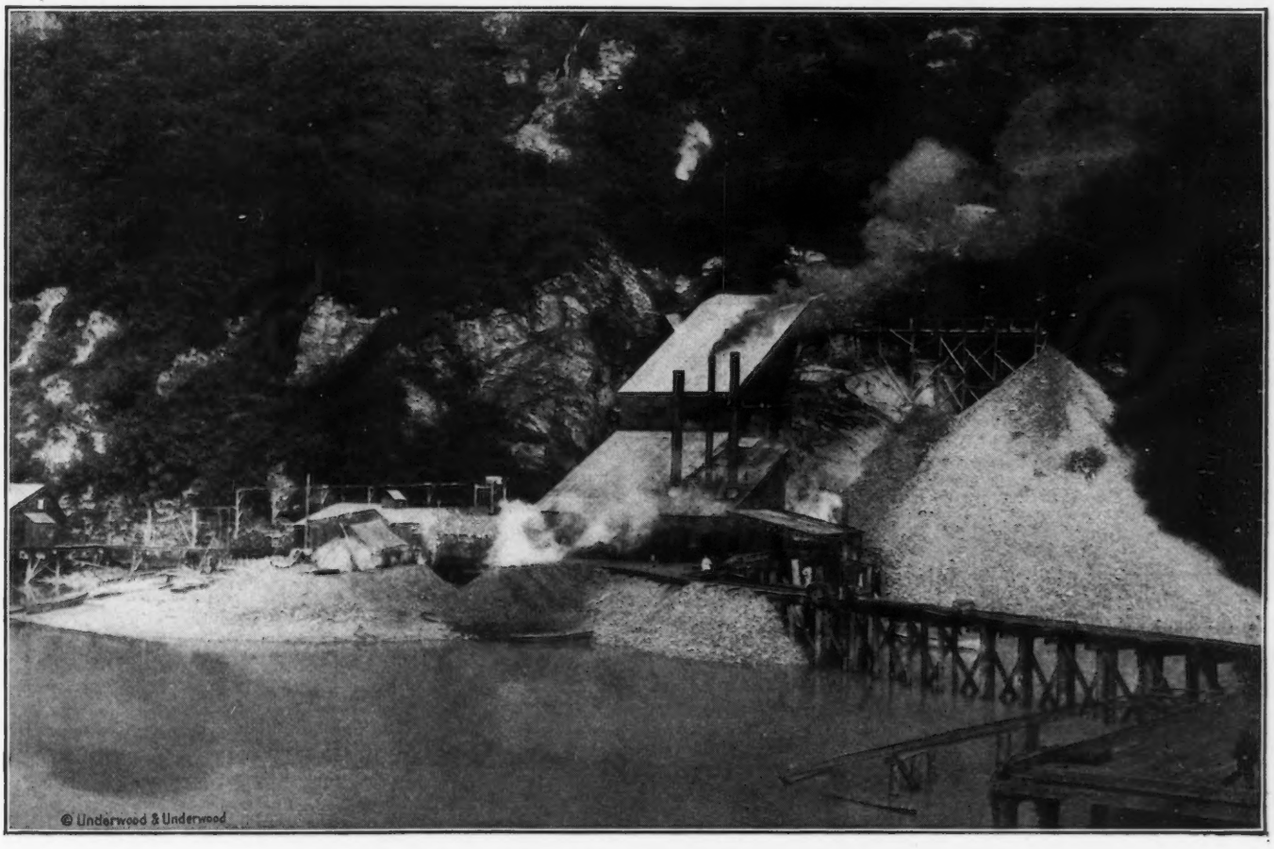
Photographs from the Field



THE HARBOR OF JUNEAU, ALASKA

Headquarters and commercial center for the large gold-mining developments now in progress nearby

LANDING AT THE TANTALUS COAL MINE ON THE YUKON RIVER, NEAR DAWSON



GOLD CLIFF MINE AND MILL, VALDEZ, ALASKA

Copper in Germany

An article in the London *Times* on "War and Copper" has attracted wide attention. It is said to be the work of a high authority on the statistics and use of copper. We reproduce the article, through the *Journal of Commerce,* as follows:

Probably one of the most pressing questions in Germany at the present hour is her need of copper and the means by which she shall provide for that need. If consumption exceeds production, copper must be imported, however large the accumulated stores; and if the blockade of the seas instituted by France and England is effective—that is, if no copper can reach Germany, either directly or through neutral ports—then Germany's fate is sealed. And for this reason: Without copper there can be made no ammunition; and, the expenditure of ammunition being immense, the consumption of copper is immense.

The front upon which the troops of the five great nations are fighting extends to some 400 miles in the west and more than 560 miles in the east, Serbian battlefields excluded. As in Poland the concentration of troops does not seem to be as great as it is in France and Belgium, we cannot reckon the firing line at more than, let us say, 750 miles (1,320,000 yd.).

In Germany the men under arms certainly exceed 4,000,000; in Austria-Hungary, at the same rate, they exceed 2,500,000. These 6,500,000 men represent roughly five men per yard. If we reckon half of this number as employed in the rear, there remain at the front 2½ men per yard. Of these, again, a portion belong to the artillery and cavalry, the officers, the sappers and miners, the medical corps, etc. Making all due allowances for these, we may safely reckon on one man and a half per yard. Reckoning conservatively, let us admit only one man per yard. This represents, for 750 miles 1,320,000 yd., roundly 1,300,000 rifles.

What is now the average number of shots per rifle per day? With reference to the many daily "engagements" at several points, where thousands of shots are fired in a few hours over a short front, it is probably not an exaggeration to put it at 20 per man: 26,000,000 shots for every 24 hr. A rifle cartridge weighs about 6.77 drams, equal to 184½ grains. The total weight of brass necessary for this daily rifle fire is therefore 26,000,000 by 6.77 drams, equal to 687,578 lb., or, roundly, 305 tons. If we calculate Maxim gun fire at 10% of the rifle fire, we have: Rifles, 305 tons; Maxim guns, roughly, 30 tons; making a total of 335 tons.

Doubtless upon a hard soil some small portion of the expended cartridges is recovered. But in the mud nothing. Estimating on an average, it can hardly reach 5%. We therefore get about 17 tons recovered. The weight of brass lost is, accordingly, 335 tons, less 17 tons, equal to 318 English tons.

To these figures must be added those for artillery fire. This it is difficult to estimate. It is said that on some of the "hottest" days of the battle of the Marne the Allies fired 180,000 shells. On the other hand, certain authorities claim that France cannot manufacture more than from 70,000 to 80,000 shells per day. To be brief and to be well within the truth, suppose we admit for the English, French and Belgian artillery an expenditure of 90,000 shells a day. The Germans must respond with at least an equal number, especially if we consider the greater length of the fighting line on her eastern frontiers and the numerous important battles which have there taken place. This gives a total of 180,000 shells a day. Let us say 150,000. The brass used for these shell cases and shells may be estimated as follows:

	Lb.
First—150,000 fuses of an average weight of 7 oz. fully lost, roundly	65,625
Second—150,000 cartridges of an average weight of 61 oz., of which about 80% are recovered $\frac{150{,}000 \times 61 \times 0.2}{16}$ roundly	114,375
Third—About 200,000 rings (to fit the rifling) for shells entirely lost	56,250
Total	236,250

The weight of brass lost will be 105 tons and 1050 lb., making, with the above mentioned 318 tons, a total of 433 tons 1050 lb., say 430 tons. The copper in the brass used by Germany and Austria-Hungary forms 72% of this metal. The total need of copper for the above mentioned weight of brass is therefore 430 × 0.72, equaling 309 tons 2 cwt. These 309 English tons each day make in round numbers 112,000 tons a year.

To face such a need of copper Germany has, of course, her accumulated stores. But these are not inexhaustible unless uninterruptedly renewed. She has, too, the importation of metal through neutral countries. In time of peace Germany produces on an average 26,000 tons of copper. This output can be increased, but not indefinitely. At the utmost we do not think it could be increased by 40%. Let us admit, however, that Germany can produce 36,000 tons.

It is said that Austria produces 4000 tons of copper yearly. This is highly problematical. Indeed, the production of Austria might, in all likelihood, be estimated at nothing. However, admitting 4000 tons, we get a total output for both empires of 40,000 tons a year. Their annual need of copper for the actual war will then be 112,000 — 40,000, equaling 72,000 tons; that is, about 7200 railway wagons, 360 trains of 20 wagons each.

CONCLUSION

Now, in spite of the fact that Germany has for years been preparing for this war and has probably laid by large stores of copper, that already she is feeling the pinch is apparent. She is making efforts to obtain this metal from any quarter and at any cost. She is said to have denuded Belgian domiciles of their kitchen utensils, to have wrenched off and removed the brass doors of the railway station of Antwerp. Copper is smuggled across her frontiers in cotton bales and orange boxes.

Moreover, according to the "Frankfurter Zeitung," even the electric-light installations in Germany are being dismantled for the sake of their copper. This extreme measure is at present resorted to only in the smaller towns which have to substitute acetylene gas as an illuminant. Furthermore, the price of copper in Germany has increased 200% since the commencement of the war! And this situation will become every day more strained, for the war will not continue upon the same scale as heretofore and will be more and more expensive in men and ammunition. The artillery is being constantly increased, and the main body of English forces has still to come to the front. And to the increase of firing Germany must respond in equal measure.

The estimate of 112,000 long tons per annum for the military requirement of copper in Germany and Austria-Hungary agrees closely with an estimate recently made in the *Weekly Report,* published in Berlin by the American Association of Commerce and Trade, which undoubtedly repeats German information. In that publication it was stated that "the yearly volume of copper required for war purposes in Germany has reached now 100,000 metric tons, of which amount only 25,000 metric tons are being produced in Germany. Assuming that copper cannot be brought into Germany at all, an amount of 75,000 metric tons must be drawn from the supply on hand in order to comply with the demands of warfare. In view of the fact that during the last five years the import of copper has exceeded the export by at least 200,000 metric tons per year, the actual copper material in Germany has increased by approximately 1,150,000 metric tons including the volume of the home production. This material must serve eventually for war purposes, in case the ready supply gives out."

It is inconceivable that Germany is going to be hampered in its military operations by shortage of copper, for it will naturally draw upon its present installations of copper if worst comes to the worst; but if the military waste be as great as these figures indicate there will be a great void to be filled when rebuilding is done after the war.

American Institute of Mining Engineers

At the first meeting of the board of directors of the American Institute of Mining Engineers, Philip N. Moore, of St. Louis, was elected first vice-president of the Institute. The other vice-presidents are Sidney J. Jennings, Thomas H. Leggett, F. W. Denton, H. C. Hoover and L. D. Ricketts.

Correspondence and Discussion

Ownership of Bolivian Mines

May I correct the statement in the JOURNAL of Oct. 31, p. 797, that much German and British capital is invested in Bolivian mines? By the following list, which is correct to my best knowledge, although there may be slight variations in the production figures, you will perceive that nearly all the tin from this country is produced by Bolivian- or Chilean-owned mines and that European and American capital is very meagerly represented. Aramayo, Francke & Co. is the only English concern of importance, but it cannot be called an English investment. The mines have for many years belonged to Avelino Aramayo and Mr. Francke, and as far as I understand all the stock is at present privately held, Mr. Aramayo, who lives in London, being the principal shareholder.

BOLIVIAN-OWNED MINES

Names	Situation	Owned by	Approximate Monthly Production of Concentrate in Quintals
Uncia	Dept. of Potosi	S. I. Patiño	20,000 - 25,000
Huanuni	Dept. of Oruro	S. I. Patiño	5,000 - 8,000
Cerro Rico de Potosi	Dept. of Potosi	Various	2,000 - 3,000
Andacaba	Dept. of Potosi	Quesada Alonso	1,000 - 2,000
Avicaya	Dept. of Oruro	Abelli & Cia. (Banco Argandoña)	1,000 - 1,500
Many small mines, alluvial workings, and dumps	Various		1,500 - 2,000
			30,500 - 41,500

CHILEAN MINING COMPANIES*

Cia. Estañifera de Llallagua, Dept. Potosi	8,000 - 15,000
Cia. Minera de Oruro, Dept. Oruro	2,500 - 3,500
Cia. Minera San José de Oruro, Dept. Oruro	800 - 1,000
Sociedad Estañifera de Totoral, Dept. Oruro	800 - 1,000
Cia. Minera de Colquiri, Dept. Oruro	800 - 1,000
Cia. Minera de Monteblanco, Dept. La Paz	500 - 1,000
Cia. Minera y Agricola Oploca, Dept. Potosi	2,000 - 3,000
Cia. Minera de Antequerra, Dept. Oruro	300 - 500
	15,700 - 26,000

*Head offices in Santiago.

ENGLISH MINING COMPANIES

Aramayo, Francke & Co., Dept. Potosi	6,000 - 7,000
Porco Tin Mines, Ltd., Dept. Potosi	500 - 800
Royal Silver Mines of Potosi, Dept. Potosi	500 - 1,000
Berenguela Tin Mines, Ltd., Dept. Cochabamba	300 - 500
Morococala, Dept. Oruro, Penny & Duncan (English)	2,000 - 3,000
Nané, Dept. Oruro, Duncan, Fox & Co. (English)	300
	9,300 - 12,600

MINES OWNED BY OTHER FOREIGNERS

Lower levels in Cerro Rico de Potosi, L. Soux (French)	3,500 - 4,000
Araca, Dept. La Paz, Harrison & Böttiger (German)	2,000 - 3,000
Cerro Rico de Potosi, Bebin Hermanos (French)	800 - 1,000
Huayna Potosi, Dept. La Paz (French)	1,000 - 1,500
Jatuncaca, Dept. Cochabamba, Schlüter & Co. (German)	300
Catorce, Dept. Cochabamba, Mr. Nicolai (German)	100 - 200
Ocuri, Province Charcas, Mr. Weisser (German)	300
Tucsuhuma, Dept. Cochabamba (an Argentine company)	300 - 500
	7,700 - 10,800

Total monthly production	63,200 - 90,900	quintales barrilla
Produced by Bolivians	30,500 - 41,500	or about 46%
Produced by Chileans	15,700 - 26,000	or about 28%
Produced by English	9,300 - 12,600	or about 14%
Produced by French	5,300 - 6,500	or about 7%
Produced by Germans	2,100 - 3,800	or about 4%

The production figures refer of course to normal times; at present the production has shrunk very much. The Llallagua mine has suspended exploitation and confines its work to development, Aramayo, Francke & Co. only works bismuth, copper and silver ores, the Cia. Minera San José de Oruro only works silver ore, the Cia. Minera de Oruro is working principally silver ore with little tin, Avicaya is only developing, but the Uncia and Huanuni mines are in full swing.

I am sending you these figures without further comment. I only intend the Bolivian situation to be well understood, and want to prevent the Americans thinking there are obstacles when none exist.

M. G. F. SÖHNLEIN.

Machacamarca, via Oruro, Bolivia, Dec. 14, 1914.

Transportation of Debris by Running Water

Copies of U. S. Geological Survey Professional Paper No. 86, reviewed in the JOURNAL of Sept. 6, have just reached this country, and as a practicing alluvial miner I must confess to a feeling of disappointment that we are still left without guidance from the research physicist. That there is considerable room for the employment of "efficiency" methods in our handling of gravel by flowing water no one will deny, but so far we are without a reliable lead in the principles of our art.

Mr. Gilbert's paper consists of two main parts—experiments in a level trough, in which the flowing sand formed its own bed at a gradient appropriate to the conditions, and a much smaller number of experiments in which the sand flowed in a trough given a definite slope over a smooth or artificially roughened bottom. The slopes studied rarely exceed 3% and consequently lie outside our particular field, the investigation not being carried on for the miner's benefit, but for the Débris Commission's.

In the discussion on the experimental data the relation of capacity to slope is first studied and a formula derived to express the relations discovered. This formula implies the universal application of the law throughout the whole range of slope, but I am inclined to think, from a study of some of Overstrom's experiments at the Utah School of Mines,[1] to which the author makes no reference in his review of previous work, that while it may be adequate, as a mathematical expression, for the low grades with which he deals, it cannot be relied upon in the region of higher slopes. However, in the particular field studied, it serves to give a harmonious and close approximation to the experimental data, and is useful, if not indispensable, as a basis for further discussion.

The next chapter deals with the relation of capacity to form-ratio, and an expression is evolved which the author confesses (p. 191) has hampered the discussion of the laboratory data at every stage of the investigation, and next comes a discussion of the relation of capacity to discharge, followed by chapters on the relation to depth and to mean velocity.

[1] "Mines & Minerals," Feb., 1909.

It was my hope, while waiting for the paper to come, to find that a quietus had finally been given to the ideas which made it possible for the following to appear in the *School of Mines Quarterly* for April, 1913: "In designing a sluice then we must study, *from a hydraulic standpoint,* to get the perimeter which gives least friction and highest velocity. The main point is to get the greatest capacity per unit quantity of water. This can only be done by building the sluice so as to get the right depth of water in the sluice at the right grade." The author of the Bulletin, however, follows nearly every other writer on the subject, with the conspicuous exception of Bowie, in believing that the capacity of a channel is derivable from its shape, and that this shape can be expressed as a ratio of depth to width.

The relation of capacity to discharge receives scant justice after this, and in spite of his admission that "for every combination of slope, discharge and fineness, it is possible to reduce capacity to zero by making the stream very wide and shallow or very narrow and deep," the author puts forward a formula implying that capacity continually increases with discharge.

What actually happens is this: When a trough of fixed width and slope is supplied with water in increasing quantity, its capacity as a conveyer of débris increases, and rapidly at first, until a certain point is reached when its capacity commences to fall off, and will eventually reach zero. In fact the condition "narrow and deep" is attained, "narrow" and "deep" being relative terms. The capacity of the water per unit is by no means at a maximum when maximum capacity for that particular trough width is attained; far from it, maximum duty having been reached and passed long before. The data presented do not contain instances of maximum capacities for individual trough widths, though but a slight extension of the range of quantity might have been necessary in the narrowest trough. As it is, the author is inclined to treat data from the narrowest troughs as discordant.

Considering now the effect of constant slope and water supply with varying trough width, it is the case that an increase of width increases the capacity of a fixed quantity of water, and consequently the duty, up to a limit beyond which increase of width reduces it. The attainment of maximum capacity and duty consists then in correctly proportioning the width of the trough to the available water supply—nothing more. Nothing about depth, or mean velocity, or form-ratio. These things will take care of themselves.

The data to enable this to be done (for maximum duty) are sufficiently given in Table 12, Table 32 in this chapter being unnecessary except to betray the inadequacy of the formula, while the graph that accompanies it, Fig. 47, with the zeros of C. scattered all over the place, is worse than useless. If capacity is plotted logarithmically against quantity of water, for a constant slope and distinguishing the graphs of the different widths, an orderly series of curves is disclosed, those corresponding to the narrowest widths being met with first along the ordinate of increasing quantity, followed by those of greater width which rise more steeply and cut all those which preceded them. At the point where two curves intersect, the capacity and duty of the indicated quantity of water are the same for the two different trough widths represented, and the width of the trough necessary to secure maximum duty for that particular quantity lies somewhere between these two values, its width and capacity being usually indicated fairly well on the chart by an existing graph. The capacity thus indicated for the appropriate trough width does not, of course, indicate the maximum capacity of that trough as a conveyor. That still goes on increasing for a while with further augmentation of the water supply.

It ought not to be impossible for a mathematician to arrive at an expression of the law governing the ratio of capacity to quantity for particular widths of channel, but it will not be done by ignoring the essential characteristics of the relation. The law is probably of a simple type. But any law connecting capacity and slope (with constant width and quantity) cannot be simple, inasmuch as efficiency varies from point to point; and moreover the direction of variation of the efficiency may be reversed, it being possible for a slope to give maximum duty with certain quantity and width factors at one point and maximum capacity with different quantity and width factors at another point. The undulations of Overstrom's curves figured in Richards' "Ore Dressing" strongly suggest something of the kind.

The discovery of these laws will no doubt be useful to the débris commissioner and the reclamation engineer, but we shall be satisfied if we can be told the appropriate trough widths to employ per miner's inch on the narrow range of slopes we use and for average gravel. Surely this is not too much to ask.

R. T. HANCOCK.

Wembley, Middlesex, England, Jan. 5, 1915.

The Kinds of Spelter

There is a clerical error in the editorial on "The Kinds of Spelter" which appeared in the JOURNAL of Feb. 6. The requirements for intermediate spelter are therein stated to be:

Lead	0.20%
Iron	0.03%
Cadmium	0.05%
Total not over	0.50%

The cadmium is erroneously given as 0.05% whereas the specifications of the American Society for Testing Materials place the cadmium limit at 0.50%. In this connection, it may be of interest to say that manganese, in very minute proportions—generally not over 0.01%, is frequently present in high-grade spelter. This element is not mentioned in the specifications of the A. S. T. M., or in any specifications that I have seen; nor is it usually determined in routine analysis; yet a rather extended experience with spelter analyses shows it to be a usual rather than an unusual occurrence. Manganese, in greater or less amount, is found in nearly all zinc ores; more of it, probably, exists in high-grade spelter made directly from ore than in that made by redistillation. Although I have no data on this point, one would naturally think this to be the case.

It is an interesting question whether or not minute amounts of manganese may impart toughness or other desirable qualities to the spelter and thus give some ground to the claim that direct distilled high-grade is superior to redistilled.

A. M. SMOOT.

New York, Feb. 15, 1915.

Editorials

Alcohol and Inefficiency

A strong effort is being made to upset the prohibition law adopted in Arizona last November. This appears to have been a poorly drawn law and vulnerable because of its carelessness. However, it is unlikely that any upset will be more than temporary, the sentiment in favor of the abolition of the use of alcohol having gained such headway everywhere on economic grounds.

Some recent statements by financial authorities in Russia, which is furnishing the greatest object lesson respecting prohibition, are illuminating. Mr. Bark, the Minister of Finance, in reviewing the recovery of Russian industry after the first shock of the war said recently:

> Unemployment in the various industries is not noticeable, except in the regions where the war is in progress. Except in the small portion of Russian territory occupied by the enemy, industrial activity shows no important slackening. This comparatively favorable showing is due, in the first place, to the greater productivity of labor following the cessation of the sale of spirits. Productivity has increased from 30 to 50%, and this, to a large extent, makes up for the shortage of labor consequent upon the calling of the workers to the colors.

The Comptroller of the Treasury announced in the Duma on Jan. 25, 1915, that there was no great suffering, although the war had produced certain economic difficulties. He ascribed this condition to the prohibition of the sale of spirits. In proof of this statement he gave statistics of the national savings banks to show that the people were better off financially than before the war. The number of depositors in December, 1913, was 70,000, while in December, 1914, 291,000 persons had accounts. The total amount of deposits in December, 1913, was $17,000,000. In December, 1914, these accounts had increased to $42,000,000.

In an interview in Paris, Feb. 5, Mr. Bark reiterated his previous statements, saying: "The suppression of the alcohol monopoly entailed a diminution of 470,000,000 rubles ($235,000,000) in the budget of 1914, but the benefits of this suppression are already being felt. Although it was feared that the calling of so many men to the colors would seriously embarrass industry it has been found that thanks to the suppression of the traffic in alcohol the results of labor are from 30 to 50% higher than before the first half of 1914, when the budget showed a surplus of 155,000,000 rubles ($77,500,000)."

These are surprising figures, but the experience in some of the cities of New England that have prohibition by local option are confirmatory of them, and we do not think that any of the mine managers of Montana, Colorado, Nevada, Utah, Arizona, etc., seeing them in the light of their own observations, will find them incredible.

A London newspaper, reporting affairs in Great Britain, remarked that: "Labor still dominates the national situation. Mr. Tennant suggested that Lord Kitchener—or the King—should grant a medal to any British workman in the engineering trades who graciously consents to do his best upon Government contracts at nearly double wages during the war. If what we now hear is correct, the situation is steadily growing worse, especially on the Clyde, and many cases could be mentioned where men scarcely put in a 40-hour week. Rates of pay have risen, with the only result that the men do less work, and are even demanding extra and unearned money on Saturday, as a bribe to prevent them seeking a job elsewhere.

"Many of the employers are convinced that the Government will have to close public-houses in the armaments areas if they want the output to increase. If the men like to drink away their money, that is no affair of the state's; but they are drinking away their time and their energy, which is a very different matter at a time when the acceleration of contracts is of vital consequence. If we had heard this view expressed by temperance fanatics, we should have dismissed it for an *ex-parte* attempt to make the nation sober by martial law. But when Glasgow ironmasters talk like this, and order water instead of whisky with their mutton, one must take the proposal seriously."

Now comes the Anaconda Copper Mining Co. with the following statement in a recent issue of the *Anode*, saying: "Among the rules appearing on the bulletin boards at the mines is the following:

> Never go to work after drinking liquor, and if you must drink, Stay Home. Experience has proven that a great many accidents are caused from drinking intoxicating liquors.

"It will be remembered that from Sept. 1, 1914, to Sept. 14, all saloons in Butte were closed; that from Sept. 14 to Sept. 24 they were open only from 8 a.m. to 7 p.m., and that for the remainder of the month they were open only from 7 a.m. to 10 p.m. The accident records of the Anaconda Copper Mining Co. show the following significant figures: Number of accidents per 10,000 shifts: July, 6.22; August, 11.25; September, 4.21; October, 7.58; November, 6.07."

There is thought to be a good prospect that the states of Montana and Idaho will soon follow the example of Arizona and Colorado in declaring for prohibition and there is a prospect that even Great Britain will do something. The Chancellor of the Exchequer, in a speech at Bangor, Wales, March 1, made the following significant remarks:

> Some workmen in the armament works refuse to work a full week's work for the nation's need. They are in the minority. The vast majority belong to the class that we can depend on, but a small minority of workmen can throw whole works out of gear by reason sometimes of one thing and sometimes of another. But to be perfectly candid it is mostly the lure of drink. They refuse to work full time and when they return their strength and efficiency are impaired through the way they have spent their leisure.
>
> Drink is doing us more damage than all the German submarines put together. Russia has stopped drink. Mr. Bark, the Russian Minister of Finance, with whom I conferred in Paris, told me that the output of Russian workmen had increased from 30 to 50% since the sale of vodka had been prohibited. He admitted that he had lost £56,000,000 in yearly revenue, which he certainly could not afford, but he added that if it was proposed to revert to the old conditions there would be a revolution in Russia. The stoppage of the sale of drink in Russia had been due entirely to the Czar, and it was one of the most heroic things of the war.

The sincerity of the Russian prohibition of alcohol has heretofore been acepted by some persons *cum grano salis*, but after these official statements there ought not to remain any doubt about it.

The Blast Furnace Vanquished

To adopt the military vernacular, the blast furnace is routed and is about to retire to a more strategic point—in the background. For a number of years the blast furnace held the premier position in copper smelting. In recent years this position has been hotly contested by the reverberatory furnace, especially since it was enlarged by the Anaconda practice to its present great length; this advantage was further increased by the adoption of oil firing, and now with the perfected application of pulverized coal as a fuel and the feeding of the furnace along the side, it seems destined to outstrip the blast furnace completely in many districts. This too at a place where the blast furnace has reached its highest development, namely, at Anaconda, where the long Mathewson blast furnaces did such excellent work that the length of the blast furnace has been extended at nearly every new copper smelting works, or wherever a copper furnace was reconstructed.

At Anaconda, for the last few years, the cost of briquetting part of the charge and smelting in the large blast furnaces has been about equal to the cost of concentrating, roasting and reverberatory smelting. Mr. Mathewson now announces that it is likely that blast-furnace smelting will soon be discontinued by the Anaconda company.

With the introduction of coal-dust firing and feeding the charges along the side walls of the furnace, Mr. Mathewson states that the tonnage of the reverberatory furnace has been so increased as to represent a saving in cost of 50c. or more per ton of charge. As the reverberatory and blast furnaces were on about an even keel before, this difference in smelting cost now gives the advantage decidedly to the reverberatory furnaces. As soon as all the reverberatory furnaces at Anaconda are equipped for coal-dust firing, blast-furnace smelting will be abandoned but the plant will be maintained in good repair so that the furnaces may be available in emergencies or at times when the price of copper is high and the maximum output desired.

Under the new plan, all ore will pass through the concentrator, and there will be no division of first- and second-class ore as heretofore made at Butte. With the lower reduction costs, practically everything between the walls will be available for treatment; the cheaper reduction will thus also cheapen mining and add to the life of the Butte mines.

Copper in Warfare

Elsewhere in this issue is an article on the consumption of copper in the warfare in Europe, wherein there is an English estimate of a consumption by the German and Austro-Hungarian armies at the rate of 112,000 long tons per annum; and a German statement that the German consumption is at the rate of 100,000 metric tons per annum. These estimates are interesting both for their close agreement and for the magnitude of the figures.

If the Teutonic allies are consuming 100,000 metric tons per annum, their opponents must be using a quantity that is at least as large, which would indicate a total of 200,000 tons, or 20% of the world's maximum production. At present the rate of production is materially less. Germany and Austria-Hungary are not buying copper outside of their dominions, but the British, French and Russian demands have been an adequate explanation of the large foreign buying of copper that has been going on since last October.

Flotation Oils

The mills using the flotation process employ a variety of oils, but pine oil is probably the most extensively employed. This is an oil obtained by the distillation of yellow pine in Georgia and Florida. The first distillate is a product from which turpentine and pine oil are got by refining. The next distillate yields pine-tar oil and other products.

The total production of pine oil in the United States is not very large and with the probable extension of the flotation process there is some question as to whether enough of it will be available. We estimated that about 1,000,000 tons of ore were treated by flotation in America in 1915, requiring about 3,000,000 lb. of oil, including pine oil, pine-tar oil, creosote oil, coal-tar oils, etc. An expert in the pine-oil trade estimates that the present production of that oil in the United States is about 20,000 bbl. = 1,000,000 gal. = 7,700,000 lb. per annum. There are a great many uses for this fragrant, agreeable oil other than in the flotation process.

If, however, there should some day prove to be a scarcity of pine oil a good many mills may turn to the use of pine-tar oil, which is produced in much large quantity and is materially cheaper than pine oil. An analogous product is imported from Scandinavia, but there is no use in anybody going so far abroad inasmuch as plenty of material corresponding in everything but in name is made in America. Reverting to pine oil, about two-thirds of the American product is steam-distilled, which process is considered to give superiority in quality. As the lips of the flotation operators become unsealed we shall hear a lot about the relative merits of the several oils.

The Juneau Gold Mines

It is interesting to draw attention to the beginning of the new gold production at Juneau, Alaska. The whole United States has in recent years been producing about $90,000,000 of gold per annum. A large proportion of this has been derived from the smelting of copper and lead ores, much of which yields a little gold per ton of ore, but a great deal in the aggregate. Of gold ores pure and simple the United States mines about 10,000,000 tons per annum. The three companies that are developing the great lode at Juneau contemplate the mining and milling of about 12,000,000 tons per annum, which is expected to yield about $18,000,000 in gold. Thus from this single group of mines will be extracted more tons of ore than come from all of the gold mines of the United States at present; and they will make an output equivalent to 20% of the entire present production of gold in the United States. It may be five years before this program is realized, but the stamps of the first 1500-ton unit of the 6000-ton mill of the Alaska Gold Co. began dropping on Feb. 18.

BY THE WAY

The copper investments of Exploration Co., Ltd., now amount to over $1,000,000. At the recent annual meeting in London, Chairman R. T. Bayliss stated that the investment in the shares and bonds of copper-mining companies amounted to £220,129, more than £200,000 of which is in the Chile Copper Co., the Greene-Cananea Copper Co. and the Inspiration Consolidated Copper Co. The copper investments were increased £57,318 during the last year by the final payment on bonds of the Chile Copper Co., and by the purchase of 10,000 shares of Inspiration, which cost £35,748. The Exploration Co. is receiving 7% on its Chile Copper Co. bonds, which are also convertible into stock. Greene-Cananea is, of course, idle owing to the Mexican difficulties, and Inspiration has not yet come to bearing.

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One afternoon in the summer of 1908, when the promotion of Mexican mines was still active, a few mine-owners and engineers met at the Waldorf to see what might be the chances of doing something interesting with the Refugio mine. While chatting in the lobby, Jim Flinn of Chihuahua was recounting what had already been accomplished with the Palmilla by A. J. McQuatters, of Ft. Worth, introducing that individual to the rest of the party. As the talk progressed, along strolled a pleasant old gentleman who gave a bow of recognition. "There's a man who can tell you about the early history of the Palmilla," said Flinn. "Palmilla? Palmilla?" mused the old fellow, and a sickly grin spread over his countenance. "Yes, I sold my half-interest in that mine to the father of Pedro Alvarado for one hundred pesos, and I thought at the time that I was getting the best of the bargain. Oh, yes, indeed, I remembered the Palmilla very well." And Beckman sadly dismissed the subject with one of those gestures which one acquires perfectly only through long association with things Mexican.

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It is now announced that the Solvay Process Co. made an examination of Searles Lake in 1910 and discovered the brine to contain potash and other valuable salts. This was prior to any knowledge on the part of the California Trona Co. of the potassium content of the brine. From experiments, the Solvay Process Co. concluded that these salts were present in commercial amounts, but it was deterred from undertaking a potash enterprise by the difficulty of obtaining a good title to Searles Lake and its underlying brine. It is interesting to note that the San Bernardino Borax Co., which owns a small fraction of the crystal area of Searles Lake, is now conducting a pumping campaign to determine the effect of continued pumping on the physical condition of the well and the chemical composition of the brine. The Borax company patented its land many years ago. No other portion of the crystal body has been patented and the Federal leasing bill now before Congress contemplates the disposal of lands containing petroleum, phosphates and potash by leasing. Three applications for patent, however, have been filed by the California Trona Co. The rights of this applicant, as well as those of the holder of the earlier patented land, under the proposed leasing bill will doubtless be a subject of much discussion in the General Land Office this year.

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Death or injury resulting from "skylarking" among employees is covered by the Employer's Liability Act according to the New Jersey Supreme Court. This decision has just been handed down in the case of the dependents of William Hulley, a journeyman plumber, against Herman F. Moosbrooger, a boss plumber, of Somerville. Hulley died a year ago from injuries sustained while "fooling" with a fellow employee. Judge Daniel H. Beekman of the Somerset County Common Pleas Court awarded his dependents $6.20 a week for 300 weeks. An appeal was taken on the ground that the injury and death did not rise from Hulley's employment. The Supreme Court of the state of New Jersey confirmed the award. It apparently decided that it is natural to expect that young men will play pranks upon one another while at work and that injuries resulting from "skylarking" are covered by the Employer's Liability Act. So the employer must pay the dependents of the late William Hulley about $6.20 per week for 300 weeks because of the passing of William to some other realm as a result of the injuries he sustained while fooling with a fellow plumber instead of attending strictly to the business of plumbing. A little nonsense now and then is relished by all of us fool mortals; but when the courts get to playing such serious practical jokes on employers of labor, the latter class may quit subscribing to the New Jersey funny papers.

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In his book on Mexico, W. E. Carson makes a few of the blunders so common among authors who do not study thoroughly the language of the country they describe. The most ludicrous is the one where he speaks of an Indian hotel waitress as a "criador," thus unsexing the poor creature without deifying her. In the description of conditions at the Zavalete gold mine, near Oaxaca, a tribute is paid to the rough-and-ready Americans who put the mining properties of Mexico in conditions of commercial prosperity. But, in telling of the comfortable quarters and the road-building and other improvements installed by the inefficient Englishmen entrusted with the early exploitation of the Zavalete mine, the author either consciously or unconsciously reveals some of the prime factors which ultimately contribute to the efficient exploitation of such mines. Good trails and sanitary habitations alone do not make a mine; but a mining prospect without them often remains merely a prospect. In the western part of the State of Durango there is an excellent prospect which will eventually be a greater mine than it was in the days of the Spaniards; by them abandoned because of excessive loss of mercury in the patio-amalgamation of the complex ores. Several years ago an American rough-and-ready miner installed a small stamp and concentrator mill at the property, but a contagious disease at the camp bereaved him of wife and two charming daughters. Disheartened, he left the country, and the mill never turned a wheel or stamped a ton of ore. Such a mine *needs* a few fastidious Englishmen who insist upon conveniences for their morning tub, bah Jove; not to mention facilities for the safe and speedy transport of marmalade.

PERSONALS

Dr. John C. Branner has submitted his resignation as president of Stanford University, California, to take effect on July 31, next.

Dr. Willett G. Miller, provincial geologist of Ontario, has been awarded the gold medal of the Institution of Mining and Metallurgy, London.

Edwin E. Chase and R. L. Chase, of Denver, have been engaged in examination work in the Cripple Creek District for the past few weeks.

A. F. Main, manager of El Oro Mining & Ry. Co., Ltd., who has been in the United States for several months, leaves New York, March 5 for El Oro, Mexico.

C. R. Olson, formerly with Aurora Ore Purchasing & Reduction Co., is now mill superintendent Pittsburg Dolores Mining Co. at Rockland near Yerington, Nevada.

Guilford D. Scholl, who recently returned from an engagement in Australia, is now in the engineering department of Phelps, Dodge & Co. at Douglas, Arizona.

Fred G. Farish, of Denver, has recently been made manager of the Lluvia de Oro Gold Mining Co., Chihuahua, Mexico, and is now on his way to take charge of the property.

P. H. Argall, of Victor, Colo., has been in Denver defending his company—Stratton's Independence, Ltd.—in the suit brought by ranchmen who claim damages to their crops from mill tailings.

A. N. Nadeau, of Juneau, Alaska, one of the owners of the Jualin mine, was in Montreal recently. He was intending to sail for Paris on financial business but his trip was unexpectedly cancelled.

J. R. McWane, vice-president of the American Cast Iron Pipe Co., of Birmingham, Ala., has been elected president of the company, succeeding J. J. Egan, who has been made chairman of the board, a new position.

Joseph Daniel, assistant professor of mining in the Washington State University, is in San Francisco completing the installation of an exhibit from the mining department of the University at the Panama Pacific Exposition.

W. J. Loring, member of Bewick, Moreing & Co., London, is in San Francisco looking after interests of the company and paying a visit to the Panama Pacific Exposition. Mr. Loring has just returned from an inspection of the company's interests in Burma and Chosen.

Ricketts & Banks, New York, announce that the co-partnership heretofore existing between Pierre de P. Ricketts and John H. Banks terminated by mutual consent on March 1, 1915. From that date each carries on the same line of business independently. The address of Dr. Ricketts will be 80 Maiden Lane; of Dr. Banks, 61 Broadway, New York.

Arthur Crowfoot, who was employed at the Boston & Montana reduction department of the Anaconda Copper Co. for 19 years, has been appointed superintendent of the concentrator of the Arizona Copper Co. at Morenci, Arizona. During his term of service Mr. Crowfoot filled many different positions and had a wide experience in the operations of nearly all departments of the Great Falls plans. As chief sampler he had charge of testing and experimental metallurgical work that developed many features of the reduction processes used by this company.

OBITUARY

Otto Olsen of Trinity County, California, died at Redding on Feb. 14 of spinal meningitis. He was 35 years old. He was largely interested in gold mining in Trinity County, and was well known throughout Northern California.

W. F. Englebright of Nevada City, Calif., died at Oakland on Feb. 10, aged 57 years. He was born in Massachusetts and went to California when five years old, spending his boyhood in Vallejo. He was elected to Congress to fill the unexpired term of J. N. Gillett when the latter was elected governor. Englebright was twice reëlected to Congress. He was largely interested in mining and his record in Congress was of wor': on behalf of the mining industry.

Thomas Henry Oxnam, one of the best known mining engineers on the Pacific Coast, died at his home in Los Angeles, Feb. 16. He was born Sept. 17, 1854, at Pool, Carn Brea, Cornwall, England, and as a very young man began his mining career in the tin mines of Cornwall. In 1875 he left England and spent two years in South Africa on railroad-tunnel work for the Government, and in 1877 came to America and settled at Virginia City, Nev. From 1877 to 1884 he worked in various mining camps of California, Arizona and Colorado. In 1884 he entered the employ of the London Exploration Co. and remained with it until 1895. During this period Mr. Oxnam was located at Marysville, Mont., De Lamar, Idaho, Elkhorn, Mont., and Harqua Hala, Ariz., and rose from foreman to mine manager of the famous De Lamar mine at De Lamar, Idaho. In 1895 he left the employ of the London Exploration Co., and became manager and consulting engineer for Capt. J. R. De Lamar. In 1901 he was made manager of the Palmarejo & Mexican Gold Fields, Ltd., Chinipas, Chihuahua, Mexico. Ill health caused him to leave Mexico and in 1907 he became associated with the Consolidated Arizona Smelting Co. as vice-president and general manager. From 1908 until his death he devoted his time to private practice. He is survived by his wife, three sons and one daughter.

SOCIETIES

American Institute of Mining Engineers—A meeting of the New York Section was held on Mar. 5, at the Machinery Club, 50 Church St., New York. Following a dinner George Otis Smith, director of the U. S. Geological Survey, opened the discussion of "The War's Opportunities to make America Mineralogically Independent," in which a number of prominent members took part.

A meeting of the Southern California Section was held Feb. 24 at the Hotel Clark, Los Angeles. W. L. Austin, of Riverside, Calif., read an important paper on the "Hydrometallurgy of Copper," which was generally discussed.

INDUSTRIAL NEWS

The General Filtration Co. announces that on Mar. 15 its Pittsburgh sales office will be consolidated with its executive offices in Rochester, N. Y.

F. O. Williamson, sales representative for the Hardinge conical mill, has removed his offices from Room 330 to Room 545 Old Colony Bldg., Chicago. Mr. Williamson has been identified with the Hardinge mill for more than six years.

Information as to sluicing or hydraulicking outfits, to be used in cutting away a dirt overburden to get down to gravel bedrock, is desired by the Sydnor Pump & Well Co., of Richmond, Va. Especially are information and prices on nozzles desired.

TRADE CATALOGS

Waterbury Co., 80 South St., New York. Catalog. Fireclad wire rope. 24 pp., Illus., 3½x6 inches.

Pelton Water Wheel Co., 90 West St., New York. Bulletin No. 8. Water wheels. 64 pp., Illus., 6x9 inches.

Wile Electric Furnace Co., 8066 Jenkins Arcade, Pittsburgh, Penn. Catalog. Electric furnaces for smelting ores, precipitates, melting metals, alloys, etc. 42 pp., Illus., 4x7 inches.

Chalmers & Williams, Chicago Heights, Ill., has recently issued a new pamphlet entitled "Modern Crushing Machinery." The machines that are featured are the bronze ball gyratory crusher, Symons coarse disc crusher, tube mill with adjustable quick discharge, ball mill, Symons fine reducing disc crusher and Burt revolving filter.

"Centrifugal Pumps" is the title of a 64-p. bulletin just issued by The Terry Steam Turbine Co., giving details and data on various turbo-pump applications. The principles of operation and construction of the centrifugal pump are clearly explained, as are the details of the steam turbines which have been successfully used during the last 10 years for driving them.

The Harbison-Walker Refractories Co. has issued a book "A Study of the Malleable Furnace," the third in its series of monographs. Its purpose is summed up in its own introduction: "It aims, however, to present the vital points in as clear and concise a form as may be, so that a fair understanding of its (the malleable furnace's) principles can be had by those to whom many of our valuable scientific treatises are by no means an open book."

Editorial Correspondence

SAN FRANCISCO—Feb. 24

Protection of Oil and Gas Wells from water infiltration by a system of state control, as provided in Senate Bill No. 916, is being generally approved by oil men interested. The system of district control conducted by voluntary subscriptions of funds by owners and operators of wells affected has proved satisfactory so far as it related to or concerned the persons affected by operation of the system. In carrying out this plan, the majority of well owners or operators in fields where the system is in progress, voluntarily supported the plan and have given themselves no concern about the minority who opposed the plan. In other words, they have made the best of their opportunities and gained a great deal of profit from their experience. But the voluntary plan cannot be made to operate in all parts of the state where it is necessary to protect the oil and gas wells from water. No satisfactory bill has yet been drawn providing for district control, and it is not believed by men acquainted with such operations that any law can be satisfactorily carried out with that end in view. There were some objections to the proposed state control in the beginning of the discussion between the oil men and officials of the State Mining Bureau. But much of that objection was based upon politics. There are a number of men in California representing various industries who would prefer to let things go uncontrolled rather than submit to the control of state administration. A larger proportion, however, of mining and oil men are inclined to any administration that will give them the sort of legislation they require. The chief advantage of state control of this branch of oil operation is that every oil operator or owner will be obliged under the law not only to protect his own property, but to do it in such a way that it will act as a protection of his neighbor. Another advantage is that the operation of the system will be under the control of one supervisor who is responsible to his superior, the state mineralogist. All of the district supervisors will be held accountable to the supervisor in charge. A board of arbitration is provided for so that no operator, owner, or community of operators and owners can be imposed upon by the action of the supervisor. Under this bill, if it becomes a law, the state mineralogist will have the choosing of the chief supervisor. The bill as it has been written contains numerous minor and possibly some major faults which can be easily corrected in committee. But as a whole, it should be satisfactory, or sufficiently so to insure it a practical try-out in the desire to protect the oil and gas wells of the state from further damage by water. One advantage the bill has over others that have or may be presented is the greater probability of its passage.

DENVER—Feb. 25

Another Crusade against High Grading has started in the Cripple Creek district. Operators complain that this practice is increasing. Feb. 23, Sheriff David Kingston arrested five miners who have confessed and implicated about twelve other men, including owners of assay offices.

Cripple Creek is resuming its former distinction as a busy place. During this winter, there has been a decided revival in activities. Leases are being sought more than ever before and are being more freely granted. Many small operations are being added to the district's relatively few large-scale operations. All mills are working to capacity, while several new mills are contemplated. There is no chance now to speculate in located claims for every square foot of the inside district is patented. Hence it is simply a matter of developing patented properties in a proved region.

A Tunnel Commission was authorized by public election in this city at the time of the general excitement, last summer, over the proposed driving of the Moffatt railroad tunnel through the Front Range, and it was made a bureau of the city of Denver. Doubt was expressed regarding the constitutionality of the city driving a public-utility tunnel; some persons declared it was merely a way of giving salaried jobs. The commissioners opened elaborate offices and these were maintained until the regular city commissioners refused to meet the bills further. There has been a nice controversy between the two sets of commissioners, each set having sound arguments to back their position. Right now the matter may come to a head for the city council has balked against the payment of bills submitted by engineers engaged by the tunnel commission to report on the project a year ago. City Attorney Isaac Stevens advises the council to stand pat on these accounts until fully satisfied that they are reasonable. This, therefore, leads to a public consideration of what constitutes a reasonable engineering fee. Bills of this kind were filed by the following who claim expenses and $100 per day: David W. Brunton, $1054; John W. Finch, $907; Jacobs & Davies, $1894.

Annual Meetings of mining companies are frequent here, this time of the year. Reports rendered at recent meeting of the Elkton Consolidated M. & M. Co. state that the mine, in 1914, produced 29,509 tons of ore with gross returns of $373,423, or close to $12.65 per ton. While this is only a fair grade of ore, the company was able to distribute $200,000 in dividends and accomplish over 3900 ft. of development. It will be remembered that this mine has no means for treating its ore as have so many of the large Cripple Creek mines. Election resulted in retention of last year's officers. At annual meeting of the Portland Gold Mining Co., the president announced the net profit for 1914 as $590,594. Of this, $360,000 was disbursed in dividends. During last year new development was nearly three miles, the total length of mine workings being now over 51½ miles. The Colorado City mill treated 62,997 tons ore, making recovery of about $23.25 per ton. The Victor mill is credited with handling 210,132 tons low-grade stuff—largely dump material—having average value of $2.56 per ton. This company also reëlected its 1914 officers, headed by Frank G. Peck, president. The regular annual meeting of the El Paso Consolidated Gold Mining Co. will occur Mar. 8, in Denver, but a special meeting of stockholders has been called for Feb. 25 to consider renewal of incorporation for another 20-year term.

SALT LAKE CITY—Feb. 20

Mine Taxation, as affected by any change in the tax laws, was discussed at a meeting between the members of the committee on revenue and taxation, mining men, and members of the State Board of Equalization, Feb. 16. The committee on revenue and taxation wants the constitution relative to the taxing of mining property amended, according to the Rideout and Page bill, which proposes to amend Section 4 of Article 13 of the constitution so that mining property may be taxed the same as other property. The State Board of Equalization wants the present law relative to taxing lands, etc., at their full cash valuation enforced, instead of on a general average of 33⅓%, but at the same time to have the tax rate reduced to a point where only the necessary money would be raised. The proposed Rideout and Page amendment of Section 4, Article 13 of the state constitution, that mining property be taxed the same as other property, would necessitate some method of arriving at the cash valuation of the mining property to be taxed. How such a valuation could be placed upon a mining property was the chief point at issue. The fallacy of placing a value on mineral ground on the basis of sales of adjoining properties, as is done in the case of real estate, was pointed out. Also that valuation according to the market value of the stock was misleading, as this depended upon the speculating public. The net-proceeds plan was held to be the most equitable basis. The State Board of Equalization proposes to treble the present assessed value of farm lands and other property, to fix the valuation of mines and mining claims at three times the net proceeds, and limit the tax levy to 15 mills per annum, while the tax on net proceeds, as such, is to be abolished. Speaking on this subject, R. C. Gemmell stated that the Utah Copper Co. and the Bingham & Garfield Ry. paid total taxes amounting to $281,427 in November, 1914. The assessed valuation of both companies in round numbers was $7,300,000, and the levy was at the rate of 27.3 mills. If the assessed valuation is trebled, making it $21,900,000, and a tax rate of 15 mills assumed, the amount of taxes would be $328,500, an increase of over 60½%. This illustrates the great difference between taxes as they now are, and those which would be paid under the proposed plan. While other property has been assessed at a fraction of its value, mines have always been assessed on at least 100% of their net proceeds, and in some cases on 115 to 120% of their net proceeds. There would be danger

that in the future mines would be discriminated against by gradually lowering the assessed valuation of other property, and if necessary arranging to have a new law passed raising the maximum rate of levy above 15 mills. By varying the assessed valuation, any desired result could be obtained in taxes on other property, but the mines would always pay on a basis of at least 100% of their net proceeds. The protection given to mines by Section 4 of Article 13 of the constitution, on the basis of taxation on annual net proceeds, was considered fair and just at the time the constitution was adopted. It was understood that this would serve as a guarantee that mines would not suffer from unjust discrimination and would never be called upon to pay more than their just proportion of the taxes. No especial favors are expected by mining men, who simply ask that justice be accorded to men and corporations which assume the risk that always accompanies the development of the mineral resources of any state. Others who addressed the meeting were: W. H. Dickson, C. E. Allen, T. P. Page, W. L. Mangum, W. Bailey, F. W. Kirkham, R. Tanner, and Walter Fitch. Much opposition to the measure has developed. The committee on revenue and taxation took the various proposals under advisement. No action has yet been taken

SEATTLE—Feb. 20

The Tolovana District has found no real pay as yet, according to the most reliable reports, although good prospects have been found on several creeks. There are many prospectors at work and indications are that the district will receive a thorough testing before spring. Marsh & McQueen, laymen on the Wheeler ground, No. 2 below discovery, Livengood Creek, are down 90 ft. with their shaft. Encouraging prospects have been found and the shaft will be continued to bedrock if possible. Dave Cascadan, who is prospecting with a small drill on No. 5 above, is reported to have obtained 25c. pans from the drillings, but whether the occurrence is such as to constitute a paystreak has not been proved. From the results of the prospecting done so far it is evident that the gold occurs in strata of clay-bearing gravel separated by layers of loose, barren gravel and is not concentrated in a definite paystreak. No shaft has yet been sunk to bedrock, except on some of the unimportant tributaries of the main creeks, but it is the general belief among prospectors in the district that a real paystreak will be found on Livengood Creek as soon as bedrock is reached. This belief is based on the reasoning that, where there is much gold at a considerable distance above bedrock there should be more at the bottom of the gravel. This theory is based on the experience at Fairbanks, Circle, Hot Springs and other adjacent mining camps, where the upper gravel is practically barren and the gold is concentrated in a thin paystreak next to bedrock. The occurrence of gold in layers of tight gravel near the surface on Livengood Creek indicates, however, that the sorting action of the stream has been less thorough than at Fairbanks and elsewhere and that there is thus less likelihood of the greater proportion of the gold lying next to bedrock. This has been the general experience in the Tanana; when the top gravel carries gold in important quantities there is not usually a corresponding concentration in the bottom layer of gravel and the probability of finding a paystreak is no greater than when the upper gravel is barren.

Changes in Mining Laws of Alaska are proposed from many sections of the North, and the second session of the Alaska territorial legislature, which will open March 1, at Juneau, will consider several of the proposed measures. That there will be changes there is no doubt as many of the members are pledged in their districts to see that they are made. Particularly will a change be made in the association-claim law, though not until after a spirited fight. Under the Federal mining laws, $100 assessment work was required on any claim regardless of size. Thus when an association was formed taking up eight claims of 20 acres each, only the same amount of work had to be done on the entire 160 acres. The law passed in 1913 made $100 assessment work obligatory on every 20-acre unit, whether part of an association claim or not, and it is this section of the law which the operators are endeavoring to have repealed. Those in favor of the repeal of the 1913 law hold that it works too great a hardship on those who have taken up claims and who are unable to get the required capital to work them at once. On the other side it is claimed that unless high assessments are charged against these association claims there is too great a chance of property being held for speculative purposes only. After years of operating under the Association Claim Law, many operators have acquired properties which would be injured by such a radical change as made by the 1913 law without providing some provision for protecting those whose rights were acquired under the operation of the original act. There are too many instances of old pioneers who have held their ground for years under circumstances and conditions which showed honesty of purpose and faith in the future of the country where the pencil-and-hatchet man has not been, or if so, has long since abandoned his claims because of lack of easy money in them. The great majority in the North are in favor of the repeal of the law of 1913 levying an assessment of $100 against every 20 acres for the reason of the injustice to those who have in good conscience sacrificed much in money, labor and time under the provisions of a law to which they had a right to look for protection. This ruthless taking away of what so many have worked hard to retain without passing consideration is causing much bitter feeling in all sections of the North country. The eight-hour bill will come up again. While the general eight-hour law was defeated at the last session, an eight-hour law for quartz miners was passed and is reported to be working out successfully. The bill this time will apply however to all forms of mining and considerable opposition will develop from the placer operators on which the law would work a tremendous hardship. They were the ones who last year caused its defeat. The principle argument against the adoption of the eight-hour law as to placer mining is from the fact that so little of the year can be used in many sections of Alaska for placer work. The provision for underground placer workers may go through, but because of the fact that the operators of open-air placers must make the most of the little time they can work, there will be a concerted attempt to defeat the bill insofar as it applies to them. While a workmen's compensation bill will be introduced its future is uncertain, as not one successful candidate for the legislature had it incorporated in his platform. There will also be several changes in the Roden mining law under which all staking of claims is now being done. Mistakes are being made in all sections of Alaska in the recording of all kinds of location notices and affidavits of labor because the people as a rule, be they staker or the person who makes out the paper, fail properly to interpret the law. Even attorneys in making out papers sometimes fail to make them correctly which, in itself is an evidence that the law is vague. It is freely predicted that unless some radical changes are made in this law, the courts of the North will be choked with litigation for the next hundred years.

NEWPORT, ORE.—Feb. 17

Summer and Abert Lakes in Lake County are a subject that the State Legislature, now in session, will soon be called upon to consider, and to ratify or reject a lease recently entered into between the State Land Board and Jason C. Moore, covering their beds and waters. Since the time when it was brought to public attention that the beds and waters of these lakes carried deposits of mineral salts, numerous parties have negotiated with the board for the lease to the premises. About two years ago the properties were leased to C. M. Sain, but owing to his failure to comply with the terms of his contract it was canceled. Since the cancellation of the Sain lease other applicants have appeared, and their coming prompted the board to advertise for bids. The bids were opened at the appointed hour and a lease awarded to Jason C. Moore of New York subject to ratification of the legislature. While the State Land Board had full power under the law to lease the properties, it felt the transaction was of sufficient importance and magnitude to demand submission to the legislature for ratification or rejection. At the request of former Governor West, the State Bureau of Mines made an investigation as to the extent of the deposits, also as to the feasibility of separating and marketing the commercial salts. The report of the said bureau is now on file with the clerk of the State Land Board.

Analysis of the water of these lakes shows the following:

	Summer Lake %	Abert Lake %
Potassium sulphate	2.04	2.63
Sodium sulphate	3.37	0.40
Sodium carbonate	41.75	26.70
Sodium bicarbonate	23.63	12.67
Potassium chloride	28.70	57.40
Silica	0.53	0.23
Total	100.01	100.03

The existence of these deposits is the result of precipitation of the salts through the process of evaporation during the summer season. As the lakes are without an outlet, the only escape for the water is through evaporation. Summer Lake covers an area of about 45,500 acres, and Abert Lake an area of about 40,000 acres. The title to the properties is in dispute. While ownership is claimed by the state, there are many who insist that title is in the Federal Government and that individuals may enter and secure title under the mineral laws of the United States. By virtue of sovereignty the state owns the beds of navigable lakes and streams. If these lakes are navigable title must be in the state. If they

are not navigable the title may be in the Government or the riparian owners, or it may have inured to the state under the Federal swamp-land grant. These are questions, however, for the courts to decide. The state, in order to fully protect its rights, must proceed upon the theory that it owns the properties. Should it develop, however, that title to these lake beds is not in the state, it would still be in position to control the situation, for an act of Congress of 1877, known as the Desert Land Act, provides that the waters of all non-navigable lakes shall remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes. The waters of these lakes have, therefore, been filed on by ex-Governor West, and are being held in trust for the citizens of this state, and the rights therein will, in due time, be assigned to such parties as may be favored with a lease at the hands of the legislature. The lease between the State Land Board and Jason C. Moore is for a period of 40 years. It is made on a royalty basis, yielding the state 50c. per ton for potassium salts, 10c. per ton for sodium chloride, and 25c. per ton for all other commercial salts. Should the salts and other commercial products extracted in any one year be insufficient to yield royalties to the extent of $25,000, then the said sum shall be paid in lieu of said royalties as a rental for the year. Entering into the lease, the board exercised its best judgment. Members of a joint committee of the legislature are now investigating Mr. Moore, and the Portland Commercial Club and Chamber of Commerce claim to have found that he is responsible and will go ahead with the work if the lease is approved.

WALLACE—Feb. 20

A Railroad Up Beaver Creek, to afford an outlet for the Sunset section on the north side of the divide, is attracting much attention and it is believed that definite understanding has been reached with the O.-W. R. & N. Co. to construct a branch up that stream, a distance of about 10 miles, just as soon as the tonnage is in sight. The traffic manager of the railroad company was in conference with the directors and manager of the Interstate-Callahan company in this city about a week ago, and it is understood that by the time the mining company is prepared to deliver tonnage on the Beaver Creek side, the railroad company will be ready to handle it. Following the conference with the railroad official, the manager of the mine announced that the capacity of the present small mill near the mine on this side of the divide, and about two miles from the railroad, would be increased about one-third, evidently for the purpose of getting the greatest possible benefit from the high price of spelter, and in the meantime a crosscut will be run to give the mine a deep tunnel outlet on the Beaver Creek side.

The Interstate-Callahan Company, which is controlled by Duluth capitalists, many of whom are prominent in the iron-mining industry, has made overtures for the purchase of the Ray-Jefferson, which has great and valuable holdings west of and adjoining the big zinc mine and covers the extension of its great orebodies. It can be stated, however, that up to this time the Ray-Jefferson people have declined to enter into negotiations. The company is in the hands of Wallace and Montana men who have ample means to develop the property, and who fully appreciate the fact that the next few months will make a wonderful difference in its value. Even now the company contemplates erecting a mill this summer, and development now in progress, together with recently acquired ground, will greatly increase the amount of ore, both lead and zinc, that is in sight. That Ray-Jefferson would be a highly valuable addition to the holdings of Interstate-Callahan is apparent, for it would not only greatly increase its ore reserves, but it would also simplify the question of a permanent millsite and railroad transportation. The Interstate-Callahan is a very strong corporation and it has the making of a great zinc mine. With the great financial resources at its command, it would not be surprising if eventually the big zinc company should make a proposition that the Ray-Jefferson would not feel justified in turning down.

DEADWOOD—Feb. 25

Harney Peak Tin Mining Co. has been purchased by C. H. Kamman, of Hill City, S. D., for a number of years superintendent of the properties, who thus becomes owner of lands and improvements in Pennington and Custer Counties that represented a cash outlay on the part of the original corporation of close to $5,000,000. Nearly thirty years ago the Harney Peak Tin Mining, Milling & Manufacturing Co. was organized by New York parties. Much of the stock was placed in London, and with a treasury abundantly supplied, work was commenced under the superintendence of James Wilson. A vast acreage was purchased, much of it at exhorbitant prices, and two tin-milling plants erected. One of these was at the Etta mine, near the present town of Keystone, and the other at Hill City. As is the case with many properties where mills are constructed before the mines are sufficiently developed, milling proved a failure, and all work was discontinued. Later Dr. A. R. Ledoux of New York was appointed receiver, and in 1909 he was instrumental in organizing the Pahasa Mining Co., which took over the assets of the original corporation. This company made a careful examination of the property and offered for sale all but the choicest portions. A very large proportion of the machinery has been disposed of, and of the two big, fully-equipped mills, little remains but the buildings. The many mining plants, a score or more in number, which were erected at various mines, have been sold, their hoisting engines, compressors, boilers, pumps, etc., going to other properties in the Black Hills. Among the valuable assets were many placer locations covering valuable agricultural lands in many of the fertile valleys of the Southern Hills; some of these were disposed of. Mr. Kamman has purchased, as has been stated, the remaining interests, which include a number of highly regarded tin prospects, the machinery, buildings, placer claim ranches and the townsite of Hill City. It is stated that at the figure at which he purchased he will be able to secure a good return on his investment, merely from rentals of farms and town lots, so that in this way his property will be self-supporting aside from the mineral portion, which has great possibilities.

HOUGHTON—Feb. 25

The Douglass Houghton Monument, dedicated at Eagle River, Keweenaw County, Oct. 10, 1914, is composed of irregularly shaped pieces of typical copper-country and iron-country rocks. Prof. Hopper of the Michigan College of Mines has prepared a description of the several specimens. The most noticeable rock in the monument is the large angular piece of typical Keweenaw greenstone, in which the tablet is imbedded and which rests upon the base of the monument. This greenstone forms the high bluff extending along the west side of the valley from Cliff to Phoenix and Central. The other important rocks are: Calumet & Hecla conglomerate, foot-wall trap of the Calumet & Hecla conglomerate, hanging wall of the Calumet & Hecla conglomerate, great conglomerate, sandstone from Eagle River, amygdaloid from the Eagle River group, amygdaloid from the Ashbed group, trap from the Ashbed group, Ashbed lode, ophite, gabbro, calcite, mohawkite, native copper, Kearsarge amygdaloid, Osceola amygdaloid, sandstone from Portage Entry, copper-bearing conglomerate from Isle Royale, white marble from Dickinson County, banded jasper from the Marquette range, hard steel ore from the Marquette range, birdeye diorite from the Marquette range, Goodrich quarzite from the Marquette range, granite boulder from Eagle River.

The Trend of Exploration in the copper country is an interesting thing to observe. When the district was opened, over 60 years ago, production centered around the extreme ends of Keweenaw Point. In the vicinity of Eagle Harbor, Copper Harbor, Phoenix and other villages in Keweenaw County, such mines as the Phoenix and Cliff were the big producers, while almost 100 miles to the southwest, Ontanagon County had such mines as the Minnesota, National, etc. These properties, however, were mined principally for mass copper, and with the discovery of the Calumet conglomerate near Calumet, a new era opened for the copper country. The original mass copper mines lost their importance and soon dropped out of sight and existence. For many years after, and including the present, the great amygdaloid and conglomerate mines in the vicinity of Houghton, Calumet and Hancock, also on the south range, have furnished the production of copper from the district. About 10 or 12 years ago, however, exploration activities were directed further to the south and north, notably at the White Pine, then known as the Nonesuch, and at the old Phoenix and other properties. Of course, though, it was amygdaloid or conglomerate deposits that were being sought. There is no question but that these explorations have been more or less successful. At the White Pine, for instance, it has led to the construction of a 1000-ton mill, with underground developments in proportion. The success here has led to other explorations in the vicinity. At the north end, work continues at the Keweenaw properties, and is not unlikely to extend to other lands in the general vicinity. While it would not be particularly surprising, it would be unusually interesting if the two extremes of the district should come back into their own after a period of 50 years. There is much still to be learned and found in the Lake Superior copper country, and there is every indication that, if money and well directed efforts can find it, it will be found.

The Mining News

ALASKA

ALASKA GARNET MIN. & MFG. CO., operating garnet mine near mouth of Stikine River, plans to ship 12 tons of garnets to be offered for sale at Frisco exposition.

AMOK (Unack)—Will start 10-stamp mill on Mar. 1. Force of 16 men in mine and mill.

No. 6, BONANZA CREEK (Shushana City)—On 11 and 12 upper Bonanza a cut of 5 ft. shows ground carrying $3 per sq.ft.

ROLAND & McDANIELS (Ruby)—Operators have obtained pans running as high as $2.25 on Alabam association claim at mouth of Straight Creek. Depth to bedrock is 80 ft.

14 BELOW, CLEARY CREEK (Fairbanks)— Magnusson & Hansen and Sam Weiss, operating on 14 below, Cleary, have driven into pay. Troseth & Carlson, on 10 below, Cleary, have also discovered pay.

NO. 6 BELOW, ESTER CREEK (Fairbanks)—Charles Lynn and company, operating on this claim, were recently drowned out. The ground is 140 ft. deep and, although in good pay at the time they struck water, the operators have decided to abandon the lease rather than sink a new shaft.

KYAGANA CREEK (McCarthy)—Conrad J. Miller has taken in drill to prospect Kyagana Creek, which enters Chitina River 80 miles below McCarthy. Some prospecting was done last summer but water prevented thorough testing. Deepest shaft sunk, 17 ft., showing entire deposit to carry gold.

GOLDEN EAGLE (Golden)—Five-stamp mill at Golden Eagle mine has been completed. Will be run by water power but will not be started until spring. Tunnel driving to tap vein at 300 ft. is in 300 ft. has about 50 ft. to go. Considerable development work has been done on other veins owned by company.

MOTHER LODE COPPER MINES CO. (Kennecott)—Operating across divide from famous Bonanza mine, is shipping to Tacoma smeltery. Ore averaging 50 to 60% copper. Hauled by horses distance of 14 miles from end of tram to railway station at McCarthy. Company plans to ship more than 1000 tons before spring thaw stops hauling.

SLENNING & SLEPSOE (Fairbanks)—Nugget Creek a tributary of Goldstream, shown to have paystreak. There are 16 men working on creek and five shafts sinking. Slenning & Slepsoe, working with windlass and small prospecting boiler, have driven 118 ft. through ground estimated to run $1 per sq.ft. of bedrock.

ROGERS & KELLEY (Fairbanks)—J. C. Rogers and Michael Kelley have located 70-ft. lode on Wood River, 80 miles from Fairbanks. The lode where exposed is cut by deep cañon and can be developed in two directions at once. Abundance of water and coal for power near at hand. Little development work will be undertaken pending construction of government railway to Interior.

DENVER ASSOCIATION (Rampart)—Archie McIntosh and associates have taken five-year lease on Denver Association claim on Volcano Creek, a tributary of Clum's Fork in Birch Creek district. Ground has been thoroughly prospected and arrangements have been made to install hydraulic plant. Half-mile ditch will furnish at least three sluiceheads of water during driest part of season.

JUNEBUG ASSOCIATION CLAIM (Ruby)—Powell, Wolff & Bailey have found rich pay on lower end of claim, on Tamarack Creek. One pan taken in testing yielded $6 and 20 pans averaged $1 each. On upper portion of Junebug, McGillis, Cowan, Collins & Floyd have fair pay. About 3500 ft. upstream from Junebug claim, Crary & Olsen have pay said to go $1 per sq.ft. across a width of 40 ft.

ARIZONA

Greenlee County

ARIZONA COPPER CO. (Clifton)—Is increasing its production.

DETROIT COPPER CO. (Morenci)—Is again working full time in all departments.

SHANNON COPPER CO. (Clifton)—Work at mines at Metcalf has been resumed and smelting plant will be blown in in a few days.

CALIFORNIA

Amador County

BUNKER HILL (Amador City)—High-grade ore is being extracted from the 2400-ft. level.

ORIGINAL AMADOR (Amador City)—Reported important changes will be made in milling plant and that Hardinge mills will be installed. Stamp mill has 20 stamps and crushes about 90 tons per day. Expected that changes will increase tonnage to about 200 tons per day.

Butte County

ORO WATER, LIGHT & POWER CO. (Oroville)—First payment has been made on dredging ground at Clear Creek, near Redding in Shasta County.

Calaveras County

BRUNNER (Angels Camp)—Work has been resumed and drifting on the vein is progressing.

FINNEGAN (Carson Hill)—Work recently resumed and mill will again go into commission.

JACK RABBIT (Angels Camp)—This gravel mine at Dogtown has been unwatered and development will be resumed. Tunnel is 2000 ft. long.

NUNER (Mokelumne Hill)—Gravel reported to average $3 per car being extracted from this mine on Stockton hill. Property is equipped with a mill. Two years have been spent in development.

MAGEE & MEGAW (Mokelumne Hill)—New mill being installed at this gravel mine on west slope of Stockton hill. Mine was worked a number of years ago and developed by 2000-ft. tunnel.

Eldorado County

LITTLE VALLEY (Brandon)—Property sold at sheriff's sale on account of mortgage for a small amount.

Inyo County

SKIDOO (Skidoo)—The five-stamp mill is being equipped with electric power.

HARRISBURG (Ballarat)—The mine is equipped with 10-stamp mill. Cyanide plant will be installed.

MINNIETTA (Johannesburg)—H. H. McCarthy has leased this mine situated in Argus Range northwest of Trona. Ore is hauled by autotruck 20 miles to Trona for shipment by rail.

Kern County

TUNGSTEN reported to have been discovered on property owned by D. E. Thompson near Randsburg.

SUNSHINE (Randsburg)—Second recent strike of good ore disclosed on the 500-ft. level. Mill is running steadily and seven men are employed.

KAOLIN reported discovered at Black Mountain a few miles northwest of Randsburg by Manuel Rodgers. Clay has been tested and said to be of commercial value.

MONTE CHRISTO (Randsburg)—Neal & Sons have taken a lease on this property situated east of the Good Hope and south of the Butte and King Solomon. Property owned by J. T. Roberts.

WINNIE (Randsburg)—Murphy & Garnier, of Butte and San Bernardino Counties have taken lease on part of this property; 50-ft. shaft will be deepened and property developed. Koehn & Cram working main ledge are crosscutting 225-ft. shaft level. Prospects good for opening up high-grade ore. Crittenden & Keller working lease on another part of this property, extracting ore from the 80-ft. level. Ore will run about $100 per ton.

Merced County

MERCED RIVER MINES CO. (Mariposa)—Fourteen claims situated above Tarantula Flat owned by R. A. Keller, of Coulterville, have been bonded to San Francisco men.

Nevada County

IDAHO-MARYLAND (Grass Valley)—Negotiations looking to renewal of bond are reported to be in progress by George W. Nellis representing men who formerly operated property. Mine is equipped with complete hoisting and pumping plant and 40-stamp mill. S. P. Dorsey and others are owners.

RAGON DEVELOPMENT CO. (Nevada City)—Organized to take over and develop Ragon and Mt. Auburn claims, which are said to be on extension of Champion vein. R. H. Countiss of Chicago and R. Chester Turner, general manager of the Brunswick Consolidated, are interested in the enterprise.

Orange County

SILVERADO (McPherson)—This old mine has been reopened. Ore is shipped to Selby. Five new shoots of ore reported disclosed by tunnel.

Plumas County

MOUNTAIN MEADOWS DREDGING CO. (Greenville)—Reported that dredge will be installed in the present year. Property consists of 3000 acres, eight miles from Greenville. Property was located by Lloyd Baker, of Chicago. E. E. Stirling, of New York is now in charge.

Riverside County

THE ONE-STAMP MILL installed by Charles Reches northeast of Banning is producing $15 per day.

San Bernardino County

ORANGE BLOSSOM MINING CO. (San Bernardino)—John Denair and associates have filed an appeal from decision of local court recently made requiring the books of the company to be produced in court. The company was financed largely by local stockholders.

Shasta County

ASBESTOS CLAIMS on Mears Creek west of Sims have been sold by E. W. Hayden, of Oakland to H. L. Smith. There are 44 claims, and the purchase price is said to be about $8000.

MOUNTAIN COPPER CO. (Keswick)—Mining resumed at Horner mine employing 40 miners. Another crew of men is employed at Iron Mountain mine preparing for resumption there.

RUSSELL (Igo)—Keystone drill has been installed, ready for extensive prospecting of ground formerly known as the Russell Ranch. Good values have been disclosed in former prospecting on the bedrock.

VICTOR POWER & MINING CO. (Knob)—Eighty-five men are employed by this company in Harrison Gulch district. Cyanide plant running full time treating tailings in old dumps. The three mines Victor, Gold Hill, and Midas are being developed on large scale.

DREDGE will be installed on Bulls Bar south of Copley on Sacramento River by Dr. James M. McIntyre, of Sacramento. The dredge is to be 100 ft. long and 40 ft. wide, to cost about $25,000. Nine claims are to be worked. Press Lockhart of Centerville is superintendent.

Trinity County

LA GRANGE (Weaverville)—Half a mile of flume in the 4-mile line leading from Stuarts Fork, Trinity River, was washed out by recent storm. Repairs immediately undertaken.

Tuolumne County

SUGARMAN (Sonora)—Reported that Robert Watson and Charles Smith have made a strike of rich ore.

SPRINGFIELD TUNNEL & DEVELOPMENT CO. (Sonora)—The drainage tunnel is now in more than 2400 ft. A station has been cut and a raise will be driven to tap the gravel channel above.

RAWHIDE (Jamestown)—Reported that John L. Whitney who developed Atlas mine has secured bond on the Rawhide from Alex Chalmers, who represents control of property which is held by Patterson Estate of Fresno.

COLORADO

Boulder County

BOULDER TUNGSTEN PRODUCTION CO. (Boulder)—New hoisting plant will be installed at 1905 shaft. Shaft will be sunk to about 500 feet.

HOMESTAKE MINING CO. (Boulder)—West heading of 280-ft. level from main shaft is being advanced toward Ward Rose property. Drift is developing payable ore ranging in value from $60 to $80 a ton. The company intends to develop property as rapidly as possible. J. E. Yearick is manager.

FOREST MINING CO. (Wallstreet)—Main shaft is 300 ft. deep and sinking in progress to 400-ft. level. Vein has been opened for length of 200 ft. and has width of 5 ft. in new development. Considerable low-grade ore has been developed ranging from $5 to $10 a ton. The property has recently been placed in good repair and equipped with an electrically driven mining plant. A. H. Scruggs is manager.

Clear Creek County

LITTLE EDGAR (Idaho Springs)—Lessees French & Horn will develop and operate west workings of this property through Big Five tunnel. Work has commenced.

TENNESSEE TUNNEL (Idaho Springs)—A contract will be let to advance this tunnel 1000 ft. to develop veins west of Little Mattie and Silver Glance properties in Freeland District.

SUN & MOON (Idaho Springs)—Lessees Olson & Co. are advancing east drift from tunnel level. Large body of low-grade ore being developed and mined. Material is shipped to Argo mill for treatment.

GOLDEN EDGE (Idaho Springs)—A winze which has been sunk 80 ft. below tunnel level has opened body of low-grade ore. It will be sunk to 110 ft. and drifts driven on the vein. J. P. Ruth is superintendent.

VITAGRAF MINING CO. (Idaho Springs)—This company has lease on block of ground in Big Five tunnel. A winze has been sunk to a depth of 60 ft. and payable ore has been opened. Sinking will continue and drifts will be driven on the vein.

PEWABIC MINING & LEASING CO. (Idaho Springs)—This company has a lease in Big Five tunnel on block of ground 500 ft. long, east of Vitagraf Co.'s ground. Development work will begin at once and a winze sunk 100 ft. on the vein. Ed. Quigley is manager.

Eagle County

ALPINE (Red Cliff)—Pool of Leadville men is developing mine under lease and reports striking vein of gold-silver ore from which shipments will soon begin.

Lake County

GARBUTT (Leadville)—Daily production continues close to 200 tons of 1-oz. gold ore.

LITTLE CHIEF (Leadville)—Lessee Austin Blakey has begun shipments of zinc-carbonate ore.

NEW VINNIE (Leadville)—This mine, contiguous to the Ibex property and under lease to Cortellini and Hahnewald, is showing up well in drift from Little Jonny No. 4 shaft and will soon become regular producer.

San Juan County

HERCULES CONSOLIDATED MINING CO. (Silverton)—On March 10, the entire property of company, in Animas Mining District, San Juan County, will be sold at sheriff's sale in Silverton to satisfy a judgment amounting to about $87,400. Property includes 25 lode claims, 13 of which are patented; 13 mill sites, of which 9 are patented; six tunnel sites; the Whitman flume and water right and Melville Mining and Reduction Co.'s water right. Bulk of property is on Sultan Mountain.

San Miguel County

LAKE SUPERIOR-OPHIR MINING CO. (Ophir)—Short tramway from mine to mill is complete and in satisfactory operation. Development in progress in lower level of mine and pay ore now being opened.

BLACK BEAR (Pandora)—Tramway, which was recently damaged by snowslide, is again in operation. Enough ore being delivered to the Smuggler-Union mills to supply 20 stamps. Systematic development in progress in the mine, and four levels are opening milling ore of encouraging value.

Teller County

MONUMENT (Victor)—Rose and Cammenish, lessees, have 3-ft. shoot of 1-oz. ore.

ISABELLA (Altman)—High grade was recently found on 5th level of Empire shaft by lessees.

JOHN A. LOGAN (Cripple Creek)—Ordered new compressor with capacity for 25 additional drills.

HALF MOON (Cripple Creek)—Palace Leasing Co. will install air drills and push development.

PINTO (Independence)—In addition to rich ore, mill is treating much low-grade stuff assaying less than $4.

ANCHORIA (Cripple Creek)—Inactive for years, again on shipping list. Plans made for extensive development.

MARY McKINNEY (Anaconda)—All company operations will be suspended below 7th level while shaft is being sunk 100 ft. from 1100-ft. station.

DOCTOR-JACK POT (Anaconda)—Starkweather and Potts, leasing the Ingham vein, are developing 20-ft. shoot said to run nearly 1 oz. gold per ton.

ABE LINCOLN (Cripple Creek)—A 4-ft., $15-per-ton orebody has been found on 5th level west of shaft by lessee who has developed it about 100 ft.

GOLD KING (Cripple Creek)—This Poverty Gulch mine has been for some time under lease to Owen Roberts, who produces about 20 cars of low-grade ore per month.

SITTING BULL (Independence)—New lift of 250 ft. will be sunk in main shaft while developing proceeds in upper levels. An electrically driven compressor is being installed.

BUENA VISTA (Independence)—Development being pushed on level 13 where vein is 5 ft. wide, shipments running about 1½ oz. gold per ton. Campbell lease shipping from strong shoot at junction of Buena Vista and Cheyenne veins.

VINDICATOR (Independence)—Slime-treating addition is being made to new concentrating mill that now handles nearly 100 tons per day. A steel headframe will be erected over No. 2 shaft. Systematic development maintains good ore reserves.

C. O. D. (Cripple Creek)—Freiberg lease has discovered a 3-ft. vein, of which 8 in. assays 15 oz. gold per ton. Sinking will be continued to depth sufficient for drifting and stoping. Owners propose to sink main shaft 500 ft. more and develop at greater depths.

C. K. & N. (Cripple Creek)—Three sets of lessees are producing good ore, some shipments running 4 oz. gold per ton. Strong oreshoots have been disclosed within and in contact with a 20-ft. phonolite dike that previously proved productive in Old Gold, Lonaconing and Henry Adney mines.

IDAHO

SUNSET BANNER (Wallace)—Two feet of zinc-lead ore exposed in drift which promises importance.

INTERSTATE-CALLAHAN (Wallace)—Machinery arrived for addition to mill increasing capacity from 300 to 400 tons. Northern Pacific engineers now in Nine Mile said to be endeavoring to locate line to mill.

MICHIGAN

Copper

AHMEEK (Ahmeek)—No increase in production for at least 3 months, because of no milling capacity. Within 30 days after the resumption of full-time operations at mines in this district every stamp head is working full tilt. Subsidiaries of Calumet & Hecla are working to capacity owing to destruction of the Isle Royale's 3-head plant. Two more heads in Ahmeek mill will be ready for operation not later than May 15. The work on their installation is going forward rapidly. The Ahmeek has two heads beside these which can be put into condition for work in a few months.

Iron

PALMS (Bessemer)—Nearly 1000 men are now employed at this property, rushing work on lease which has not long to run. There is still a large orebody to be taken out. This mine is controlled by the Newport Mining Co.

RAVENNA (Crystal Falls)—Hollister Mining Co. closed this property last week, throwing 130 men out of work. Local management does not know how long mine will be idle, but pumps will be kept in commission. No reason given for shutdown.

BALKAN (Alpha)—Stripping operations will be resumed here with drag lines about May 1. New level is being opened 100 ft. below the first level, which is 160 ft. below surface. New level being opened up with drifts and raises ready to supplement first level when milling operations commence next fall. The opening up of this level so far in advance will drain the orebody above and make mining easier.

INDIANA (Iron Mountain)—Drift on 90-ft. level almost completely filled with sand a few days ago. Work of reopening mine was started a few weeks ago by Thomas Furnace Co., of Milwaukee. It was supposed that drift was low enough to find solid ground, but it developed that there was a deposit of fine sand occupying a trough whose bottom was below level of drift. Work of clearing out sand is now in progress.

MINNESOTA

Cuyuna Range

CROFT (Crosby)—Some difficulty has been experienced in keeping this concrete drop shaft straight during sinking. It has been found necessary to change from clam-shell bucket to pick-and-shovel excavation in bottom of the shaft.

Mesabi Range

LEONARD (Chisholm)—Large coal docks are being constructed here for Arthur Mining Co., the Great Northern subsidiary.

HAWKINS (Nashwauk)—New shops of steel construction have been completed. Much of old machinery has been replaced by new and uptodate equipment. A club house for company's employees has also been erected.

MISSOURI-KANSAS-OKLAHOMA

S. PATRICK & SONS (Galena, Kan.)—This company has one of richest openings in district on N. J. Ryan lease, southeast of Galena. Will assay 30% as hoisted. Company has had trouble with soft ground but believe it to be safely timbered now.

PORTIA MINING CO. (Galena, Kan.)—Struck good body of zinc ore at a deeper level than heretofore worked. This is a new mine on old tract. Recently opened, and now making good returns. Mine has good ventilation as it recently drilled air holes and cased them so as to give the drifts good air. Two more mill propositions have been let by Mr. Ping. Will be in operation before long, the parties having machinery ready to move up on ground.

MONTANA

Granite County

MONTANA PHOSPHATE CO. (Maxville)—This company capitalized at $5,000,000 and financed in New York, was organized to develop Philipsburg phosphate beds, and has planned to construct a mill at Maxville after having executed a contract with a Japan firm to furnish 80,000 tons of phosphate annually. Product is guaranteed to contain 62% phosphate of lime. John D. Field, in charge of the operations, says Montana phosphate can be put on market for $2 or $3 lower than any other.

ROYAL BASIN (Maxville)—At a conference held in Butte Feb. 16, between John D. Field, member of the Royal Basin Mining & Milling Co. at Maxville, and Sanford McKeever of New York, it was decided to sink a 2000-ft. shaft from the 200-ft. level of the Royal Basin property developing levels at every 200 ft. Ore will be treated by a leaching and flotation process evolved by Mr. Field. The mill has capacity of 500 tons. Mr. Field will hereafter devote his time to the Field's Metal Recovery Co., a new $5,000,000 corporation which will build a 100-ton testing plant at Butte or Maxville.

Silver Bow County

BUTTE-BALLAKLAVA (Butte)—After having been down for several weeks to permit retimbering of shaft and making other improvements, mine resumed operations on Feb. 15 under direction of leasers. Production will reach 100 tons per day. Shaft sinking from the 1600- to the 2000-ft. level will be carried on as well as development work on lower levels. About 50 men will be employed.

LA FAYETTE (German Gulch)—A lease on these claims was given to C. M. Lane by O. Rouleau and E. R. Page. Option is for $165,000. Claims are at head of German Gulch near Durant, and comprise the La Fayette and five other claims. McLane is to begin work by Mar. 1 and patent claims in the name of the lessors and to pay them a royalty of 25% of net profits. Samples of the ore have run as high as $70 and $75 a ton in gold. Development work comprises between 700 and 800 ft. of tunnels. Another lease was given by Perry Beal and associates to James Breen of Spokane for five claims adjoining the La Fayette group. Ore in this group assays between $7 and $8 a ton. Property is well developed. On surface ore shows a width of 40 to 60 ft. Both groups are low-grade propositions and will use cyanide process.

NEVADA

Churchill County

GOLD STRIKE NORTHEAST OF BROKEN HILLS DISTRICT. Will be developed by San Francisco men.

Esmeralda County

GOLD STRIKE AT KLONDYKE made recently. Shallow shaft opened 2-ft. shoot of ore showing free gold. Ore being sacked for shipment.

BLUE BULL (Goldfield)—Development work resumed; work confined to 700-ft. level.

LONE STAR (Goldfield)—Hoisting plants installed at two shafts and development work progressing at both points.

GOLDFIELD SHALE MINING CO. (Goldfield)—Operating lease on Spearhead ground installed hoisting plant; will sink at once to 750-ft. level.

JUMBO EXTENSION (Goldfield)—Shipments of 100 tons of $80 ore made daily. Two oreshoots of importance in addition to main oreshoot opened recently.

YELLOW TIGER (Goldfield)—Machinery recently damaged by fire replaced and new compressor and motors received. Work will be resumed on 700-ft. level where shipping-grade ore exposed.

Lyon County

RESCUE (Yerington)—Two-foot oreshoot assaying $100 per ton cut on 180-ft. level.

APRIL FOOL (Manhattan)—Mill run netted $50 per ton; development work progressing steadily.

VALLEY VIEW (Manhattan)—Recent milling test gave satisfactory results; considerable milling-grade ore opened.

BULL HEAD (Manhattan)—Formerly known as Gold Crater. Shoot of enriched schist cut in drift on 150-ft. level, supposed extension of Big Pine shoot.

EMPIRE NEVADA (Yerington)—Lessees Oberg & Taylor are sinking new shaft in ore; shipments will be made to Salt Lake. Other lessees are working.

JIM BUTLER (Tonopah)—Production from Wandering Boy shaft now 50 tons daily, from 6th, 7th and 8th levels. Development work progressing with satisfactory results.

Storey County

MERGER OF GOLD HILL MINES made; includes Crown Point, Belcher and Yellow Jacket. Combined resources will permit development work that any one company could not undertake.

Washoe County

NEVADA'S MINERAL EXHIBIT has been shipped to San Francisco and will be installed by Prof. J. C. Jones and J. H. Price, of University of Nevada. Exhibit includes high-grade ore valued at $20,000.

NEW MEXICO

Grant County

CHINO COPPER CO. (Hurley)—New turbine engine being installed at power plant.

JIM CROW MINE (Steeple Rock)—Shipments to begin. Unwatering completed. Branch railroad from near Duncan to Steeplerock reported under consideration.

SILVER GLANCE MINING & DEVELOPING CO. (Silver City)—Company has filed incorporation papers. Capitalization $25,000. Have holdings near Cliff, N. M. Baylor Polk, R. P. Barnes and C. C. Royall, incorporators. Expect to do immediate development work.

Sierra County

BARNEY CABALLERO MINE (Kingston)—Two-year lease and bond taken on claims. Shaft sinking in progress. Reported compressor and drills to be installed.

SOUTH DAKOTA

Lawrence County

SNOWFALL THIS WINTER, to Feb. 17, totals 50¼ in. as measured by the Government's voluntary observer at Deadwood. All but a few inches of this has fallen since the first of the year. A generous supply of water for mining purposes thus seems assured for the coming summer and fall. Wasp No. 2 company is working day shift only in the opencut and producing about 250 tons daily. Other producers have been enabled to operate at full capacity despite weather conditions.

UTAH

Juab County

TINTIC SHIPMENTS for week ended Feb. 12 amounted to 79 cars; those for week ended Feb. 19, to 50 cars, by seven shippers. The lowered tonnage is due to recent severe snowstorm, which prevented many properties from shipping. Damage was done to power and telephone lines. The advance in the price of spelter will enable May Day, Lower Mammoth, Gemini, East Tintic Development, Yankee, and others, to mine ore carrying as low as 24% zinc.

Piute County

ARMOUR & CO. of Chicago and Florence Mining Co. of Pittsburgh preparing to open alunite deposits in vicinity of Marysvale. Contracts signed to furnish these companies several million board feet of lumber for building material and cross-ties for tramways. Beaver River Power Co. has let contract for $350,000 plant on the Beaver River and Florence Mining Co. purchased 10 acres of land to erect power plant on the Sevier River.

Salt Lake County

CARDIFF (Salt Lake)—Work in raise continues, but no effort is made to break ore, owing to adverse shipping conditions.

WASATCH MINES (Alta)—This company whose property embraces former Columbus Consolidated has two cars of ore ready for shipment.

ALTA CONSOLIDATED (Alta)—Three cars of ore of good grade have been accumulated. The ore recently opened has been drifted on for 50 ft., averaging ½ to 2½ ft. thus far. A raise is up 35 ft. with ore in the breast.

Tooele County

DULUTH-UTAH (Stockton)—A dividend of 4c. per share has just been paid, amounting to $2250, as a result of part payment for claim sold to E. J. Raddatz and associates for $15,000. In all $12,000 will have been paid since April, 1914.

VIRGINIA

S. L. BOGGS of Ivanhoe, developing zinc mine, will build 100-ton mill this spring.

WASHINGTON

BLACK PINE will install five additional stamps in its mill, according to Hunter B. Supplee, formerly manager now president of company.

LAST CHANCE (Northport) lately acquired by Norman Lead Mines Co. of Spokane, will start development at once. A 1500-ft. tunnel will be driven to cut vein 770 ft. on its dip. Sidney Norman is manager.

CANADA

British Columbia

BRITISH COLUMBIA COPPER CO. (Princeton)—Will build concentrator at Princess camp near Princeton, B. C., where diamond drilling has proven much ore. Company has good force at work during winter and accommodations for large mining population have been constructed. It is reported that railway construction will begin early from Princeton to Princess and Voigt camps. At present the company hauls all material and supplies from Princeton.

Ontario

DOME LAKE (South Porcupine)—The production of the mill to end of January amounts to $19,850. The main shaft is down to the 400-ft. level.

NORTHERN ONTARIO POWER (Cobalt)—Gross earnings for 1914, $875,195. Operating expenses, $211,023, net profits, $664,172, as compared with $658,408 for the preceding year. Bond interest took $273,360 and preferred dividend $142,758 leaving surplus of $248,054.

PETERSON LAKE (Cobalt)—Ore being taken from a branch vein at 200-ft. level averaging about 3 in. wide of medium grade. Winze being put down 100 ft. Gould leasehold is likely to revert to the Peterson Lake, in which case it will be worked by the company.

HOLLINGER (Porcupine)—Statement for four weeks ended Jan. 28, shows gross profits of $150,986, from treatment of 22,849 tons ore averaging $11.10 per ton, working cost $3.96 per ton. High-grade ore encountered on the 800-ft. level of No. 1 vein. No. 16 vein has been cut on 300-ft. level and No. 2 vein crosscut on 425-ft. level. Working force increased by about 200 men.

The Market Report

Metal Markets

NEW YORK—March 3

Copper was dull and, toward the close of the week, weaker. Lead and tin were both stronger. Spelter advanced further, but relatively little business was done, and this market is considered to be arriving at an impossible position.

Copper, Tin, Lead and Zinc

Copper—During the first half of the week the market was rather flabby, with only a moderate business done at 14½@14¾c., regular terms. Business was so dull that several agencies reported no sales. A good deal of talk was made of some sales to Europe at about £69¾, or 14¾c., c.i.f., but it was figured that they did not net over 14.30c., f.o.b., New York.

In the latter half of the week, the market became very dull indeed and turned a shade weaker. At the close, copper was freely offered at 14½c., regular terms.

In spite of irresponsible reports to the contrary, the copper market is believed to be statistically in a strong position. Statements as to this are supported by the knowledge that the principal producers have lately been increasing their output. Although business has been dull during the last few weeks, deliveries on old orders have been made at a large rate.

Copper sheets base price is now 19¾c. per lb. for hot rolled and 20¾c. for cold rolled. Usual extras charged and higher prices for small quantities. Copper wire is quoted at 15½@15¾c., carload lots at mill.

Tin—Only a small business was done, and this market is characterized as dull. However, there was a sharp advance in price which is ascribed to uncertainty of delivery owing to the withdrawal of ships from the trans-Atlantic service. The New York price which was previously below the London equivalent is now above it.

Visible stocks of tin reported on Feb. 28, including tin afloat: London, 7210; Banka and Billiton, 1927; United States, excluding Pacific ports, 5411; total, 14,548 long tons, an increase of 647 tons during February.

Banka tin in hands of the Trading Co., Jan. 31, was 3995 tons. A report comes from Europe that 2000 tons of Banka tin have been sold to Germany at about £200 per ton, which is equivalent to 43.5c. per lb.

Lead—Up to the end of February lead was freely sold at 3.85c., New York, while the St. Louis market was at 3.80c., which was quite out of joint with things here. Sales for export could be made, however, at 3.90c., f.o.b., New York. Conditions generally had been stiffened by large sales for export previously made. During the morning of March 1 the A. S. & R. Co. raised its price to 3.90c., New York. Relatively little business was reported after the advance. Demand from domestic consumers is very light.

Spelter—During the first half of the week the market was at about 9@9½c. Prices of 10c. and upward were realized for spot metal, but such transactions were only lots of a few tons. In fact, nothing but small lots were available. Some lots amounting to several hundred tons, for prompt and March delivery, were bought at 9½c. Spelter for April and May delivery was held at 9⅛@9¼c., and for June at 8¾@9c. There was practically no demand from domestic consumers and Europe would not buy at current prices here. The London price of £43 was figured as equivalent to 8.60c., St. Louis.

During the latter half of the week this market was quite at sixes and sevens, sales of spot, prompt and March spelter being reported above 10c., and sales of May-June at 9c., with all kinds of bids in between. Bids of extravagant prices appear to be made by dealers and speculators for deliveries that they know to be impossible and do not expect to get. On the other hand, producers appear to be unwilling to loosen up on April and May deliveries, which they can supply. They are keen about selling May-June and later deliveries for which there is not at present any large demand.

Neither the fancy prices that are paid by belated customers for small quantities of near-by metal, nor the relatively low prices at which distant futures are offered represents the basis at which spelter can be bought and sold in quantity for the purposes of consumption. It is extremely difficult to determine what that basis is, and we are able to quote only aproximately. Spelter is fast arriving at an impossible position, if it has not already arrived. Smelters who buy ores on sliding-scale contracts find themselves obliged to take in quantities far in excess of the spelter they can sell. The present level of spelter price is killing consumption for purely industrial purposes. Galvanizers who have sold ahead, and have not covered their spelter requirements, will of course, pay whatever price they have to, but when present contracts are filled, they will sell black sheets, etc., instead of galvanized sheets.

The exports of spelter from the United States in January were about 16,000 tons. In February an exportation of 5444 tons is reported from New York, Philadelphia and Boston.

DAILY PRICES OF METALS IN NEW YORK

Feb. Mar.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
25	4.8013	48⅝	14.35 @14.55	38½	3.85 @3.90	3.77½ @3.82½	8.92½ @9.67½	8.75 @9.50
26	4.8000	48¼	14.35 @14.55	38¾	3.85 @3.90	3.77½ @3.82½	9.17½ @9.67½	9.00 @9.50
27	4.7988	48⅛	14.35 @14.55	39¼	3.85 @3.90	3.77½ @3.82½	9.17½ @9.67½	9.00 @9.50
1	4.7975	49¼	14.35 @14.55	40½	3.90	3.80 @3.85	*9.67½ @10.17½	*9.50 @10.00
2	4.7988	49	14.35 @14.45	41	3.90	3.80 @3.85	*9.67½ @10.17½	*9.50 @10.00
3	4.8000	49⅛	14.30 @14.40	40½	3.90	3.80 @3.85	*9.67½ @10.17½	*9.50 @10.00

*Nominal.

The quotations herein are our appraisal of the markets for copper, lead, spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37½c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Feb.-Mar.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
25	22⅞	64½	14.01	64¾	....	178	157½	20 1/16	4.36	42⅛	9.15
26	23	64½	14.01	64⅞	....	180	158	20¼	4.45	42½	9.22
27	23 1/16	.....	.....	.....	.....	.....	.....	.....	.....	....	....
1	23¼	64⅜	14.04	65½	....	183	161½	20¼	4.40	43	9.34
2	23¼	64⅜	13.93	64½	....	183	162	20 3/16	4.39	43	9.34
3	23⅜	63	13.69	63¾	....	178	160	20 3/16	4.39	43	9.34

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10=2.17½c.; £15=3.26¼c.; £20=4.35c.; £30=6.52c.; £60=13.05c. Variations, £1 = 0.21¾c.

Zinc sheets are again a little higher and are quoted today at $13 per 100 lb. f.o.b. La Salle, Ill., less 8% discount. Usual extras charged.

Other Metals

Aluminum remains quiet with deliveries mainly on contract. Prices are not quite so strong, 19@19¼c. per lb. being quoted for No. 1 ingots, New York—**Antimony** is strong, supplies being short, though business has been rather light. Ordinary brands are 18½@19½c. per lb. Cookson's is entirely nominal; 23@24c. per lb. has been bid, but there is none to be had—**Nickel** is unchanged, ordinary forms being 40@45c. per lb. according to size and terms of order. Electrolytic, 3c. higher—**Quicksilver** continues strong, though business has been rather more quiet. New York quotation is a shade easier at $60 per flask of 75 lb. for large lots. San Francisco $59 for domestic orders. London quotation is £12 15s. per flask.

Gold, Silver and Platinum

Gold—Arrangements were reported Feb. 27 for the transfer of $3,250,000 gold to New York from the special reserve of the Bank of England at Ottawa. A total of $1,000,000 gold is reported coming from Japan, $250,000 having already arrived at San Francisco. A shipment is reported of $750,000 from London for New York.

Gold production of Rhodesia in January was $1,223,912 in 1914; and $1,467,198 in 1915; an increase of $243,286 this year. There was, however, a decrease of $78,691 from December, 1914.

Platinum—The market continues dull and unchanged, with little trade outside of contract business. Dealers still ask $42, but sales are reported at lower prices. We continue to quote $38@42 per oz. for refined platinum and $44@49 per oz. for hard metal.

Silver—The market has been stronger the last week owing, it is thought, to Continental orders, while supplies have not been overplentiful in the London market.

Gold and Silver Movement in the United States in January is reported by the Department of Commerce as follows:

	Gold		Silver	
	1914	1915	1914	1915
Exports	$6,914,056	$ 691,509	$4,009,539	$5,187,662
Imports	10,442,373	6,896,398	2,318,352	2,286,796
Excess	I.$3,528,317	I. $6,204,889	E. $1,691,187	E. $2,900,866

Exports of merchandise in 1915 were valued at $267,801,370; imports, $122,265,267; excess of exports $145,536,103. Adding the gold and silver, leaves $142,232,080 as the net export balance.

Zinc and Lead Ore Markets

JOPLIN, MO.—Feb. 27

Blende, high price $76; assay base 60% zinc low lead $73@68; high lead, $68@65; metal base suspended; calamine base 40% zinc low lead, $45@42; high lead $42@38; average, all grades of zinc, $68.84 per ton. Lead, high price, $49; base, $47 per ton of 80% metal content; average, all grades of lead, $47.05 per ton.

SHIPMENTS WEEK ENDED FEB. 27

	Blende	Calamine	Lead	Values
Totals this week	9,037,530	1,179,960	1,754,920	$394,020
Totals two months	91,319,310	8,840,950	13,746,440	$3,180,860

Blende value, the week, $324,820; two months, $2,699,430.
Calamine value, the week, $27,910; two months, $158,840.
Lead value, the week, $41,290; two months, $322,590.

PLATTEVILLE, WIS.—Feb. 27

The base price paid this week for 60% zinc ore was $70@72 per ton; one or two settlements of last week's sales were made on a $74 base. The base price paid for 80% lead ore was $48 per ton.

SHIPMENTS WEEK ENDED FEB. 27

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,070,740	165,000	256,800
Year	33,174,600	470,000	3,133,100

Shipped during week to separating plants, 3,510,410 lb. zinc ore.

Iron Trade Review

NEW YORK—March 3

The general situation is not materially changed. New business continues to come in at a moderate rate, and there is confidence in a steady though slow improvement in the situation.

More orders for rails are reported. The structural situation is improving, negotiations being on foot for several large contracts which are likely to go through soon. Some round orders for export are reported, especially for steel bars, wire and rails. The ocean freight situation is still discouraging for this trade. The mills again report an increase in the rate of production.

The Algoma Steel Co. at Sault Ste. Marie, Ont., has taken a contract for 25,000 tons of rails for the Illinois Central.

Pig Iron Production in the United States in the second half of 1914, according to the preliminary statement of the American Iron & Steel Association was 10,796,150 long tons. This gives the make for the entire year as follows:

	1912	1913	1914
First half	14,072,274	16,488,602	12,536,094
Second half	15,654,873	14,477,699	10,796,150
Total	29,727,147	30,966,301	23,332,244

The corrected production for 1914 shows a decrease of 7,634,057 tons, or 24.7%, from that of 1913; and of 6,394,903 tons, or 21.5%, from 1912. The second half of 1914 showed a drop of 1,739,944 tons from the first half.

HOBART

PITTSBURGH—Mar. 2

Steel-mill operations continue at 55 to 60% of capacity, showing no change for two or three weeks. Orders are unchanged in volume and are just about sufficient to maintain the present rate of operation. In many directions the demand is fairly satisfactory, this being particularly true with tinplate, wire products and steel pipe. Demand for all railroad material is exceedingly slack, showing scarcely any improvement over the late months of last year, and structural business is also slack.

In accordance with the announced program of the mills the 1.10c. price on bars, plates and shapes was withdrawn last week, and the market is now 1.15c. for March and 1.20c. for second quarter. Large buyers are well covered by old contracts and the new price is not likely to be subject to much pressure, but should it once yield the market might drop considerably. Effective yesterday the differential for galvanizing wire was increased from 40 to 50c. per 100 lb., making galvanized wire 1.90c. and galvanized barb wire 2.10c. The sheet mills are firm at 3.40c. for galvanized sheets, making an advance of $15 a ton in a few weeks, due to the very high cost of spelter.

Pig Iron—Demand for merchant iron has continued of moderate proportions, but there is a slight increase in small-lot business in foundry grades. The market is unchanged: Bessemer, $13.60; basic, $12.50; No. 2 foundry, $12.75@13.25; malleable, $12.75; forge, $12.50@12.75, f.o.b. Valley furnaces, 95c. higher delivered Pittsburgh. W. P. Snyder & Co. report the pig-iron averages for February, computed from actual sales, at $13.60, Valley, for bessemer and $12.50 for basic.

Ferromanganese—Hopes are somewhat increased of a resumption of ferromanganese shipments from England, on a moderate scale. Many of the steel mills have agreed to purchase additional tonnages at $68, Baltimore, to match the tonnages due them on old contracts at $35 to $38. Small lots of prompt are quotable at about $100.

Chemicals

NEW YORK—March 3

The general market is quiet, with only a little special activity here and there.

Arsenic—Business is dull and sales small. Prices are unchanged at $3.75@4 per 100 lb., for both spot and futures.

Copper Sulphate—Business is steady and sales fair. Quotations have been again advanced 25c. and are now $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is moderate, but steady, and prices are advancing. Quotations are 2.20c. per lb. for spot and up to July 1; 2.15c. per lb. for later deliveries.

Potash Salts—The total sales of the German Kali-Syndikat in 1914 amounted to 156,000,000 marks—$37,128,000—showing a decrease of 36,000,000 marks from 1913. Up to the end of July there was an increase in 1914 of 11,000,000 marks. The cost of production has increased owing to scarcity of labor and higher cost of materials.

A cablegram from the American Embassy at Berlin says: "Foreign office states that the exportation of kainit (a potash salt containing less than 20% of potash) will be permitted."

Imports of kainit into the United States were 329,611 tons in the year 1914, and 465,650 tons in 1913; a decrease of 136,039 tons.

Assessments

Company	Delinqe	Sale	Amt.
Belcher Silver, Nev.	Feb. 8	Mar. 1	$0.10
Booth, Nev.	Jan. 25	Mar. 1	0.02
Brunswick Con., Nev.	Feb. 16	Mar. 9	0.01
Caledonia, Nev.	Mar. 8	Mar. 31	0.05
Cedar-Talisman, Utah.	Feb. 8	Mar. 1	0.005
Clear Grit, Ida. (post.)	Feb. 9	Mar. 3	0.0015
Confidence, Nev.	Mar. 11	Mar. 31	0.10
Con. Virginia, Nev.	Feb. 24	Mar. 18	0.10
Copper King, Ida.	Mar. 1	Apr. 1	0.005
East Hercules, Ida, (post.)		Mar. 3	0.001
Emerald, Utah (three instal.)		June 9	0.01
Gethin Le Roy, Utah (post.)	Feb. 16	Mar. 7	0.02
Idaho-Nevada, Ida.	Mar. 10	Apr. 2	0.002
Index, Ida.	Feb. 27	Mar. 27	0.005
Indiana, Mich.	Feb. 4		1.00
Iron King, Ida.	Feb. 18	Mar. 19	0.001
Jack Waite, Ida.	Mar. 1	Mar. 24	0.01
Kentuck, Nev.	Mar. 18	Apr. 7	0.02
Keystone, Utah. (post)	Feb. 23	Mar. 23	0.02
King Pine Crk., Ida.	Feb. 12	Mar. 13	0.002
Laclede, Ida.	Mar. 20	Apr. 6	0.003
Majestic-Idol, Nev.	Dec. 15	Jul. 20	0.005
Manhattan Con., Nev.	Feb. 28	Mar. 1	0.01
Nor. Bnkr. Hill, Ida.	Jan. 30	Mar. 6	0.002
Ophir, Nev.	Feb. 11	Mar. 5	0.10
Oreano, Ida.	Mar. 25	Apr. 26	0.0015
Overman, Nev.	Mar. 8	Mar. 26	0.05
Pioche Coalition, Nev.	Feb. 10	Mar. 1	0.025
Reindeer-Queen, Ida.	Feb. 15	Mar. 8	0.003
Rescue-Eula, Nev.	Feb. 11	Mar. 22	0.01
Saltese, Ida.	Mar. 1	Apr. 1	0.002
Selma, Utah.	Mar. 20	Apr. 6	0.0025
Sierra Nevada, Nev.	Feb. 8	Mar. 2	0.05
Snowstorm Ex., Ida.	Feb. 19	Mar. 22	0.003
Sonora, Ida.	Mar. 15	Apr. 15	0.002
Syndicate, Ida. (post.)		Jan. 28	0.001
Tarbox, Ida. (post.)	Jan. 28	Mar. 25	0.0025
Tar Baby, Utah.	Mar. 5	Apr. 5	0.005
Tonopah Midway, Nev.	Mar. 12	Apr. 12	0.01
Torino, Ida.	Feb. 20	Mar. 20	0.001
Utah, Nev.	Mar. 25	Apr. 15	0 02
Utah-United, Utah	Feb. 20	Mar. 15	0.01
Wolf Mountain, Utah.	Mar. 15	Apr. 14	0.0015

Stock Quotations

The interesting financial feature of the week is the $16,000,000 note issue of the Anaconda company, to finance its purchase of the United Metals Selling Co.

COLO. SPRINGS Mar. 2		SALT LAKE Mar. 2	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.05½	Beck Tunnel	.06½
Cripple Cr'k Con.	.007	Black Jack	.09½
C. K. & N.	.06	Colorado Mining	.12½
Doctor Jack Pot.	.08¼	Crown Point	.01½
Elkton Con.	.47	Daly-Judge	5.25
El Paso	1.50	Gold Chain	‡.08¼
Findlay	.03	Grand Central	.63
Gold Dollar	.04	Iron Blossom	.99
Gold Sovereign	.03	Little Bell	‡.10
Isabella	.16½	Lower Mammoth	.06
Jack Pot	.06½	Mason Valley	1.25
Jennie Sample	.03	May Day	.14
Jerry Johnson	.03	Opohongo	.01½
Lexington	.007	Prince Con.	.41½
Old Gold	‡.01	Seven Troughs	.02½
Mary McKinney	.32	Silver King Coal'n.	3.05
Pharmacist	.01	Silver King Con.	1.90
Portland	1.12½	Sioux Con.	.05
Raven B. H.	.03	Uncle Sam	.06½
Vindicator	1.29	Yankee	.07

TORONTO Mar. 2			
Bailey	.01½	Dome Exten.	.06
Coniagas	4.75	Foley O'Brien	.15
Peterson Lake	.23	Hollinger	22.12
Right of Way	.02	Imperial	.01½
Seneca Superior	1.12	Jupiter	.08½
Silver Queen	‡.02	McIntyre	.30
T. & Hudson Bay	20.00	Pearl Lake	.01½
Timiskaming	.16	Porcu. Gold	‡.25
Wettlaufer-Lor.	.05	Preston E. D.	.01½
Big Dome	6.00	Rea	.10

SAN FRANCISCO Mar. 2			
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.16½	Belmont	3.75
Belcher	.32	Jim Butler	.65
Best & Belcher	.07	Lone Star	.06
Caledonia	.16	MacNamara	.03
Challenge Con.	.05	Midway	.10
Confidence	.14	Mont.-Tonopah	.45
Con. Virginia	.19	North Star	.13
Crown Point (Nev.)	‡.19	Rescue Eula	.08
Gould & Curry	.05	West End Con.	.52
Hale & Norcross	.05	Atlanta	.29
Julia	.01	Booth	.31
Mexican	.39	C.O.D. Con.	.05
Occidental	.80	Comb. Frac	.08
Ophir	.13	Jumbo Extension	.67
Overman	.05	Pitts.-Silver Peak	.10
Potosi	.01	Round Mountain	.37
Savage	.05	Sandstorm Kendall	.08
Sierra Nevada	.11	Silver Pick	.06
Union Con.	.19	Central Eureka	‡.25
Yellow Jacket	.38	So. Eureka	‡2.25

N. Y. EXCH. Mar. 2	
Name of Comp.	Clg.
Amalgamated	53⅛
Am.Sm.&Ref.,com	62⅛
Am. Sm. & Ref., pf.	101
Am. Sm. Sec., pf. B.	‡78
Anaconda	25⅝
Batopilas Min.	.50
Bethlehem Steel	54⅛
Bethlehem Steel, pf.	103½
Chino	35⅛
Colo. Fuel & Iron.	23
Federal M. & S., pf.	24½
Great Nor., ore., ctf.	31½
Guggen. Exp.	50
Homestake	117
Inspiration Con.	19½
Mex. Petroleum	66
Miami Copper	19½
Nat'l Lead, com.	50½
National Lead, pf.	106½
Nev Consol.	12
Ontario Min.	2
Phelps Dodge.	‡175
Quicksilver, pf.	1
Ray Con.	16⅛
Republic I&S, com.	19½
Republic I&S, pf.	75½
SlossSheff'd, com.	24
Tennessee Copper.	27
Utah Copper	51½
U. S. Steel, com.	42⅞
U. S. Steel, pf.	104½

N. Y. CURB Mar. 2	
Name of Comp.	Clg.
Beaver Con.	.26
Big Four	.07
Blue Bell	.04
Braden Copper	6⅛
Buffalo Mines	.75
Can. Cop. Corpn.	1⅛
Can. G. & S.	.04
Caribou	.50
Chambers Ferland	.11
Con. Ariz. Sm.	.25
Coppermines Cons.	‡1½
Davis-Daly	.94
Diam'field-Daisy	.07
Dia. Black B.	.03½
Ely Con.	‡.01
Florence	.54
Goldfield Con.	1⅛
Goldfield Merger	.21½
Greene Cananea	26½
Kerr Lake	4⅛
La Rose	11/16
McKinley-Dar-Sa.	.42
Mines of Am.	2
Mutual Min., pf.	‡2½
Nevada Hills	.26
New Utah Bingham	‡1/16
Nipissing Mines	5⅛
Ohio Copper	.05
Oro	.08
Pacific Smelt.	1/32
South Utah	10
Stand'd Oil of N.J.	387
Standard S. L.	1⅛
Stewart	1⅛
Tonopah	7
Tonopah Ex.	2⅛
Tonopah Merger	.37
Tularosa	3/16
West End Ex.	.03
Yukon Gold	2½

LONDON Feb. 15			
Alaska Tre'dwell	£7	10s	0d
Camp Bird	0	7	6
El Oro	0	9	9
Esperanza	0	9	0
Mexico Mines	4	2	6
Oroville	0	12	0
Philippine Dr.	1	0	0
Santa Gert'dis.	0	11	3
Tomboy	1	3	1½
Tough Oakes	0	13	9

BOSTON EXCH Mar. 2	
Name of Comp.	Clg.
Adventure	1
Ahmeek	250
Alaska Gold M.	28⅛
Algomah	.50
Allouez	40½
Am. Zinc	26⅛
Ariz. Com., ctfs.	4⅛
Bonanza	.31
Butte-Ballaklava	2⅛
Butte & Superior	49½
Calumet & Ariz.	53½
Calumet & Hecla	375
Centennial	16½
Copper Range	33½
Daly West	2
East Butte	9½
Franklin	4½
Granby	66½
Hancock	11½
Hedley	27
Helvetia	.25
Indiana	3½
Island Cr'k, com.	44
Island Cr'k, pfd.	88½
Isle Royale	21
Keweenaw	2½
Lake	5⅛
La Salle	3½
Mass.	4⅛
Mayflower	‡4⅛
Michigan	.70
Mohawk	55½
New Arcadian	4⅛
New Idria Quick	‡3½
North Butte	23⅛
North Lake	1
Ojibway	.50
Old Colony	3⅞
Old Dominion	41½
Osceola	70
Quincy	57
Santa Fe	1⅛
Shannon	5⅛
Shattuck-Ariz.	21½
Superior	27
Superior & Bost.	1⅛
Tamarack	30½
Trinity	2⅛
Tuolumne	.25
U. S. Smelting	20½
U. S. Smelt'g, pf.	40½
Utah Apex	2
Utah Con.	9⅛
Victoria	1⅛
Winona	2
Wolverine	48
Wyandot	.50

BOSTON CURB Mar 2	
Name of Comp.	Bid.
Alvarado	.70
Bingham Mines	‡3⅛
Boston Ely	.14
Butte & Lon'n Dev.	.17
Calaveras	1⅛
Calumet-Corbin	.11
Chief Con.	.70
Corbin	‡1
Cortez	.17
Crown Reserve	.75
Eagle & Blue Bell	.75
First Nat. Cop.	1
Houghton Copper	1⅛
Iron Cap Cop., pf.	3
Majestic	.12
Mexican Metals	.13
Nevada-Douglas	.32
New Baltic	1 1/16
Oneco	.50
Raven Copper	.07
Smokey Dev.	.10
So. Lake	4⅛
Tonopah Victor	‡.17
Trethewey	.10
United Verde Ext.	2 11/16

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067		26.669	26.788	
April	59.490	58.519		27.416	26.958	
May	60.361	58.175		27.825	26.704	
June	58.990	56.471		27.199	25.948	
July	58.721	54.678		27.074	25.219	
August	59.293	54.344		27.335	25.979	
September	60.640	53.290		27.986	24.260	
October	60.793	50.654		28.083	23.199	
November	58.995	49.082		27.263	22.703	
December	57.760	49.375		26.720	22.900	
Year	59.791	54.811		27.576	25.314	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.491	14.394	65.259	63.494	70.188	
March	14.131		64.776		69.170	
April	14.211		64.747		69.313	
May	13.996		63.187		67.786	
June	13.603		61.330		66.274	
July	13.223		60.540		64.955	
August	*		‡		‡	
September	*		‡		‡	
October	*		‡		‡	
November	11.739		53.227		*	
December	12.801		56.841		*	
Year	13.602		61.524		68.168	

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038		173.619	
April	36.154		163.963	
May	33.360		150.702	
June	30.577		138.321	
July	31.707		142.517	
August	*		‡	
September	32.675		‡	
October	30.284		‡	
November	33.304		139.391	
December	33.601		147.102	
Av. year	34.301		156.564	

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970		3.850		19.651	
April	3.810		3.688		18.225	
May	3.900		3.808		18.503	
June	3.900		3.810		19.411	
July	3.891		3.738		19.051	
August	3.857		3.715		‡	
September	3.828		3.658		‡	
October	3.528		3.384		‡	
November	3.683		3.585		18.500	
December	3.800		3.662		19.097	
Year	3.862		3.737		19.079	

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250		5.100		21.460	
April	5.113		4.963		21.569	
May	5.074		4.924		21.393	
June	5.000		4.850		21.345	
July	4.920		4.770		21.568	
August	5.568		5.418		‡	
September	5.380		5.230		‡	
October	4.909		4.750		‡	
November	5.112		4.962		25.016	
December	5.592		5.430		27.369	
Year	5.213		5.061		22.544	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15 07		13.94		14.10	
April	14.90		13.9		14.13	
May	4.90		13.90		14.27	
June	14.90		13.90		13.96	
July	14.90		13.90		13.90	
August	14.90		13.90		14.08	
September	14.90		13.90		14.03	
October	14.84		13.75		13.97	
November	14.59		13.43		13.83	
December	14.70		13.45		13.83	
Year	$14.88		$13.78		$14.01	

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be made with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COPPER

544—BRITISH COLUMBIA—Britannia Mine, Howe Sound, B. C. R. G. McConnell. (Summary Report, Can. Geol. Surv., Dept. of Mines, 1913; 3½ pp.)

545—IDAHO—The Copper Beds of the Cœur d'Alene. Geo Huston. (Min. Press, Jan. 23, 1915; 3 pp., illus.) 20c.

546—LAKE SUPERIOR COPPER MINING: Present and Future—II. Thomas T. Read. (Min. Press, Feb. 6, 1915; 7½ pp., illus.) 20c.

547—METALLURGICAL PROGRESS—Das Metallhüttenwesen im Jahre 1913. B. Neumann. (Glückauf, Jan. 2, 1915; 5½ pp.) First article, dealing with copper. 40c.

548—METALLURGY—Progress in Copper Metallurgy. Editorial. (Min. Press, Jan. 2, 1915; 1 p.) 20c.

549—MINING METHODS of the Arizona Copper Co. P. B. Scotland. (Bull. A. I. M. E., Feb., 1915; 13½ pp., illus.) 40c.

550—NEW MEXICO—Burro Mountain Porphyry Copper Development. Faris V. Bush. (Min. Press, Feb. 6, 1915; 1¾ pp., illus.) 20c.

551—NODULIZING in Copper Metallurgy. James H. Payne. (Eng. and Min. Journ., Feb. 6, 1915; 2 pp.) 20c.

552—QUEBEC—The Weedon or McDonald Copper Mine. L. D. Adams. (Bull. Can. Min. Inst., Feb., 1915; 12 pp., illus.)

553—ROASTING—Laist Roasting Patents. (Eng. and Min. Journ., Feb. 6, 1915; 2 pp., illus.) 20c.

554—SMELTING—Reverberatory Smelting Practice of Nevada Consolidated Copper Co. R. E. H. Pomeroy. (Bull. A. I. M. E., Feb., 1915; 8¼ pp., illus.) 40c.

555—SMELTING PLANTS—Designing Small Copper-Smelting Plants. Charles C. Christensen. (Eng. and Min. Journ., Jan. 30, 1915; 3¼ pp., illus.) 20c.

556—X-RAY INVESTIGATION—Application of the Coolidge Tube to Metallurgical Research. Wheeler P. Davey. (Gen. Elec. Rev., Feb., 1915; 2½ pp., illus.) 40c.

GOLD AND SILVER—GEOLOGY

557—ASHANTI—Notes on Some Gold Occurrences in Ashanti. J. Morrow Campbell. (Bull. 125, I. M. M., Feb. 11, 1915; 9 pp., illus.)

558—CHIHUAHUA—The Main Mineral Zone of the Santa Eulalia District, Chihuahua. Basil Prescott. (Bull. A. I. M. E., Feb., 1915; 44 pp., illus.)

GOLD DREDGING AND PLACER MINING

559—ALASKA—Mining in the Far North. Placer Mining in the Fairbanks District. Emil Edward Hurja. (Min. and Sci. Press, Dec. 19 and 26, 1914; 7 pp., illus.)

560—ALASKA—Mining in the Far North. The Iditarod District—Dredging and Placer Operations. Emil Edward Hurja. (Min. Press, Jan. 30, 1915; 2 pp., illus.) 20c.

561—ALBERTA—Gold on the North Saskatchewan River. J. B. Tyrrell. (Bull. Can. Min. Inst., Feb., 1915; 13 pp.)

562—COLOMBIA—Pato Property of Oroville Dredging Co. (Eng. and Min. Journ., Jan. 30, 1915; 3¾ pp.) From report of W. A. Prichard. 20c.

563—OREGON—Geology and Mineral Resources of the Sumpter Quadrangle, Oregon. J. P. Pardee and D. F. Hewett. (Min. Resources of Ore., Vol. I, No. 6, Oct., 1914; 122 pp., illus.)

564—QUEBEC—Gold-Bearing Gravels of Beauce County, Que. J. B. Tyrrell. (Advance copy, A. I. M. E., Feb., 1915; 12 pp., illus.)

GOLD AND SILVER—CYANIDING

565—ALASKA TREADWELL—Organization at the Treadwell Cyanide Plant. (Min. Press, Feb. 6, 1915; 1 p., illus.) 20c.

566—COLORADO—Ore Treatment at Cripple Creek: A Review. P. Henry Argall. (Min. Press, Jan. 23, 1915; 4 pp., illus.) From "Cripple Creek Times." 20c.

567—DECANTATION—The Development of Continuous Counter-Current Decantation in Cyanidation of Slime. W. J. Pentland. (Met. and Chem. Eng., Feb., 1915; 3 pp., illus.) 40c.

568—FILTRATION—New Filtering Process at the Treadwell Cyanide Plant. W. P. Lass. (Min. Press, Feb. 13, 1915; 2 pp., illus.) 20c.

569—GRINDING ORE for Cyanidation; A Suggested Modification of All Sliming Practice. Edson S. Pettis. Correspondence. (Met. and Chem. Eng., Jan., 1915; 1 p.) 40c.

570—LABOR AND POWER Used in Cyanide Mills. Herbert A. Megraw. (Eng. and Min. Journ., Feb. 13, 1915; 3 pp.) Nineteenth of a series of articles on comparative details of cyanide practice. 20c.

571—SOLUTIONS—Method for the Determination of Gold and Silver in Cyanide Solutions. L. W. Bahney. (Bull. A. I. M. E., Feb., 1915; 5 pp., illus.). 40c.

572—SPECIFIC-GRAVITY APPARATUS Used by Aurora Cons. Mines Co. J. M. Lilligren. (Min. Press, Feb. 13, 1915; ¾ p., illus.) 20c.

573—TUBE-MILL TONNAGE CALCULATION. Noel Cunningham. (Met. and Chem. Eng., Jan., 1915; ½ p.) 40c.

574—TUBE MILLING—Danish Tube-Mill Pebbles and Substitutes. Jay A. Carpenter. (Min. Press, Jan. 23, 1915; 3¼ pp.) 20c.

575—TUBE-MILLING TONNAGE CALCULATION and Notes on Tube Milling. Justin H. Haynes and H. B. Lowden. (Met. and Chem. Eng., Jan. and Feb., 1915; 2¾ pp., illus.) 80c.

GOLD AND SILVER—GENERAL

576—BOLIVIA—Gold Mining in Bolivia. Francis Church Lincoln. (Eng. and Min. Journ., Feb. 20, 1915; 4 pp., illus.) 20c.

577—COLORADO—Preliminary Report on the Cresson Gold Strike at Cripple Creek. H. B. Patton and H. J. Wolf. (Min. Sci., Feb., 1915; 8½ pp., illus.) From Quarterly, Colo. Sch. of Mines. 20c.

578—METALLURGY—Progress in Gold and Silver Metallurgy in 1914. Editorial. (Met. and Chem. Eng., Jan., 1915; 1½ pp.) 40c.

579—NEVADA—Goldfield and Its Present Boom. H. C. Cutler. (Eng. and Min. Journ., Jan. 30, 1915; 4 pp., illus.) 20c.

580—NEW SOUTH WALES—The Yerranderie Mining Field, N. S. W. H. Hardy Smith. (Min. and Eng. Rev., Dec. 5, 1914; 7¾ pp., illus.) 40c.

581—NICARAGUA—Eastern Nicaragua. (Mex. Min. Journ., Feb., 1915; 2½ pp., illus.) 20c.

582—ONTARIO—Mining Royalties at Cobalt. Arthur A. Cole. (Bull. Can. Min. Inst., Feb., 1915; 4½ pp.)

583—RAND—Some Features in the Mining Problems of the Eastern Witwatersrand Area. W. G. Holford. (Bull. 125, I. M. M., Feb. 11, 1915; 19 pp., illus.)

IRON ORE DEPOSITS, MINING, ETC.

584—CUBA—The Mayari Iron-Ore Deposits, Cuba. J. F. Kemp. (Bull. A. I. M. E., Feb., 1915; 25½ pp., illus.) 40c.

585—RAILWAY—The 2400-Volt Railway of the Bethlehem-Chile Iron Mines Co. E. E. Kimball. (Gen. Elec. Rev., Jan., 1915; 2 pp.) 40c.

IRON AND STEEL METALLURGY

586—AMERICAN STEEL WORKS—Neuanlagen von Hüttenwerken in Amerika. (Stahl u. Eisen, Nov. 5, 12, and Dec. 3 and 24, 1914; to be continued.) New plants of iron works in America.

587—BLAST FURNACE—Handling Iron and Cinder at the Blast Furnace. J. E. Johnson, Jr. (Met. and Chem. Eng., Jan., 1915; 7¼ pp., illus.) 40c.

588—BLAST-FURNACE PRACTICE—High-Blast Heats in Mesaba Practice. Walther Mathesius. (Advance copy, A. I. M. E., Feb., 1915; 17 pp.)

589—CANADA—The Production of Iron and Steel in Canada During the Year 1913. John McLeish. (Can. Dept. of Mines, 1914; 44 pp.)

590—CAST IRON—Novel Tests of Malleable Cast Iron. Enrique Touceda. (Foundry, Jan., 1915; 2¾ pp., illus.) 20c.

591—CASTINGS—The Selling Price of Castings. A. O. Backert. (Iron Tr. Rev., Jan. 28, 1915; 3 pp.) Paper before Am. F'd'ymen's Assn. 20c.

592—ELECTRIC FURNACE—Limitations of the Electric Furnace in the Manufacture of Steel Castings. G. Muntz. (Met. and Chem. Eng., Feb., 1915; 3 pp.) 40c.

593—ELECTRIC SMELTING in 1914. Robert M. Keeney. (Min. Press, Jan. 2, 1915; 5 pp., illus.) 20c.

594—ELECTRIC STEEL-MAKING FURNACES. T. D. Robertson. (Elec. Rev., Feb. 12, 1915; 2½ pp., illus.; also Engineering, Feb. 5, 1915.) Abstract of paper before Instn. Elec. Engrs. 40c.

595—FLUX—Phosphate Rock as Furnace Flux. James A. Barr. (Iron Tr. Rev., Jan. 21, 1915; 2½ pp., illus.) 20c.

596 — FRANCE — Die Eisen- und Metallhüttenindustrie Frankreichs im Jahre 1912. (Glückauf, Jan. 2, 1915; 3⅜ pp.) 40c.

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